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OCTOBER, 1959

MODERN METALS

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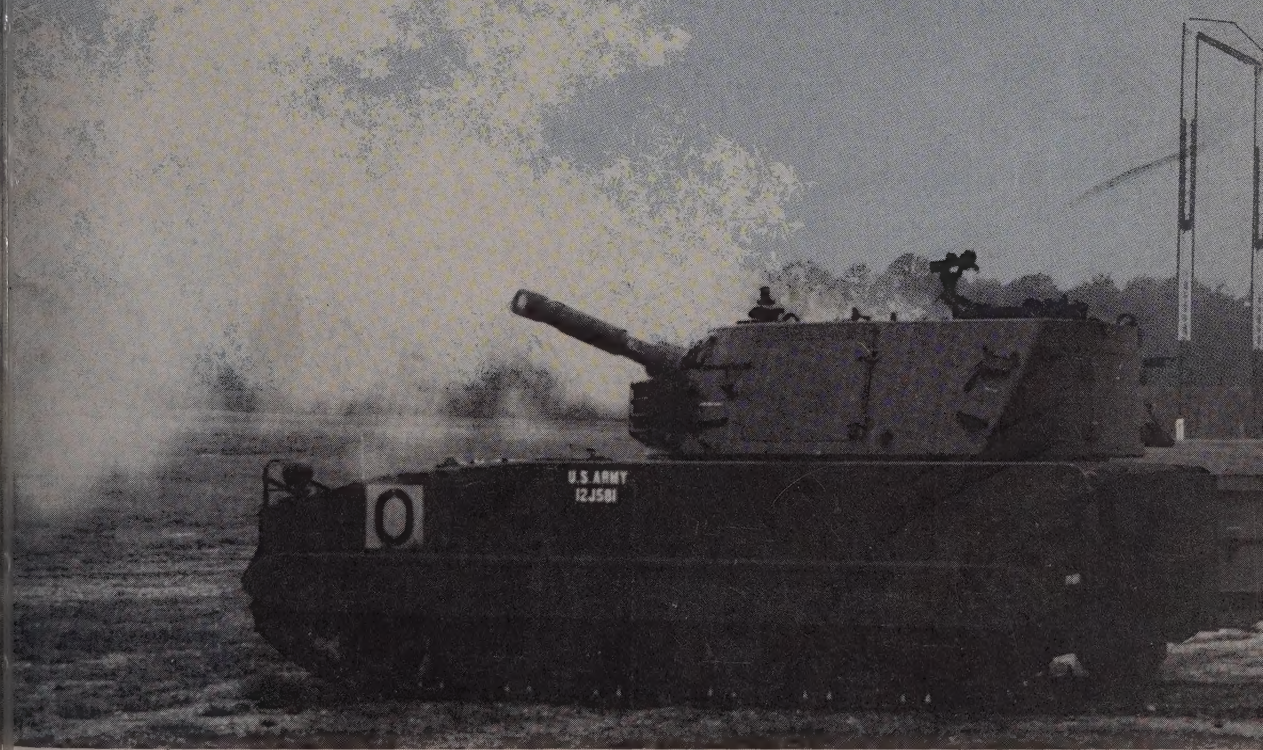
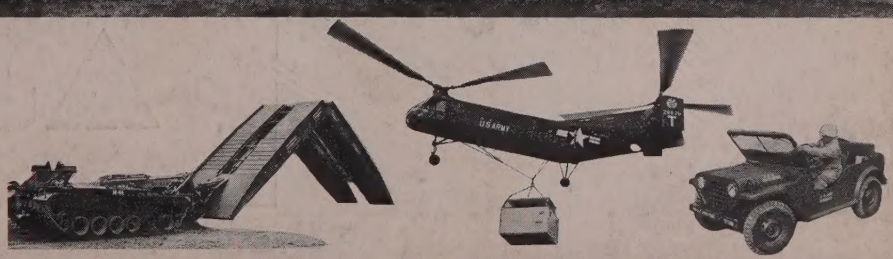


MORE ALUMINUM
means
MORE MOBILITY
to the Army Ordnance Corps
see page 36



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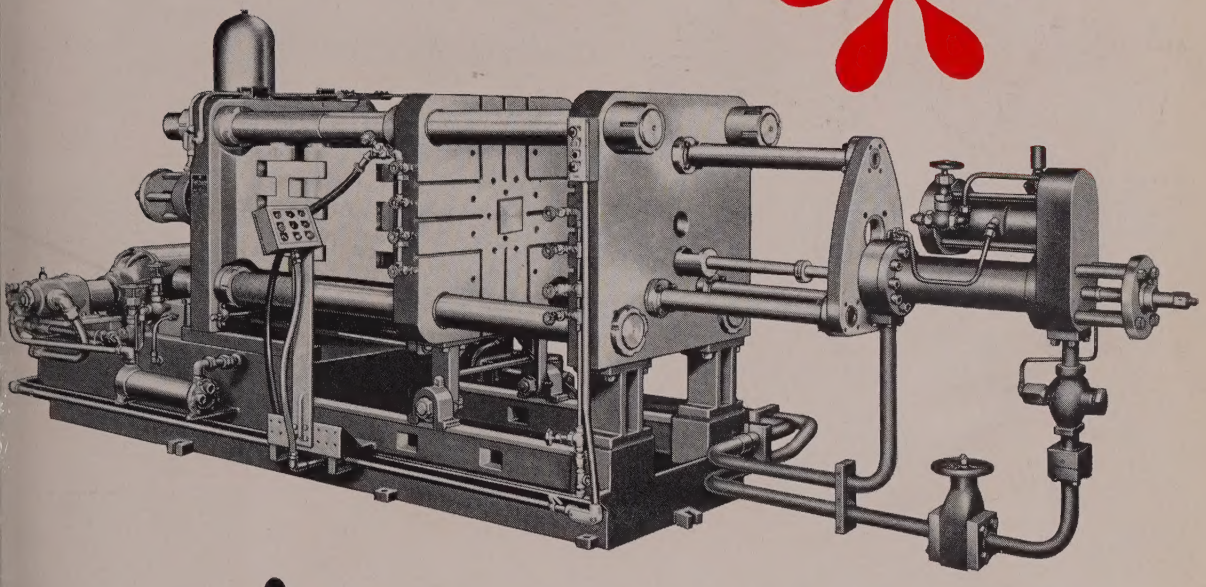

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MODEL 20A		
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Tie Bar Diameter		5½
Space Between Tie Bars		23 HOR. 25 VER.
Die Mounting Plates		7x38x40
Die Thickness	Min. Max.	8 36
Die Stroke	Min. Max.	9 15
Locking Pressure (tons)		500
Injection Cyl. Diameter		4⅝
Injection Cyl. Stroke (Adj.)		14 to 19½
Shot Position		on center and 6" below center

(All dimensions in inches)

All Cast-Masters are designed for maximum flexibility of application. You get positive die locking; heavy welded construction; heavy duty toggle clamp mechanism; adjustable die and shot stroke; wide spacing between tie bars for fast die set-up; simplified, "out-in-the-open" hydraulic system; infinitely variable injection speeds; with the big advantage that all Cast-Master models can be readily converted from cold chamber to hot chamber machines in your shop.

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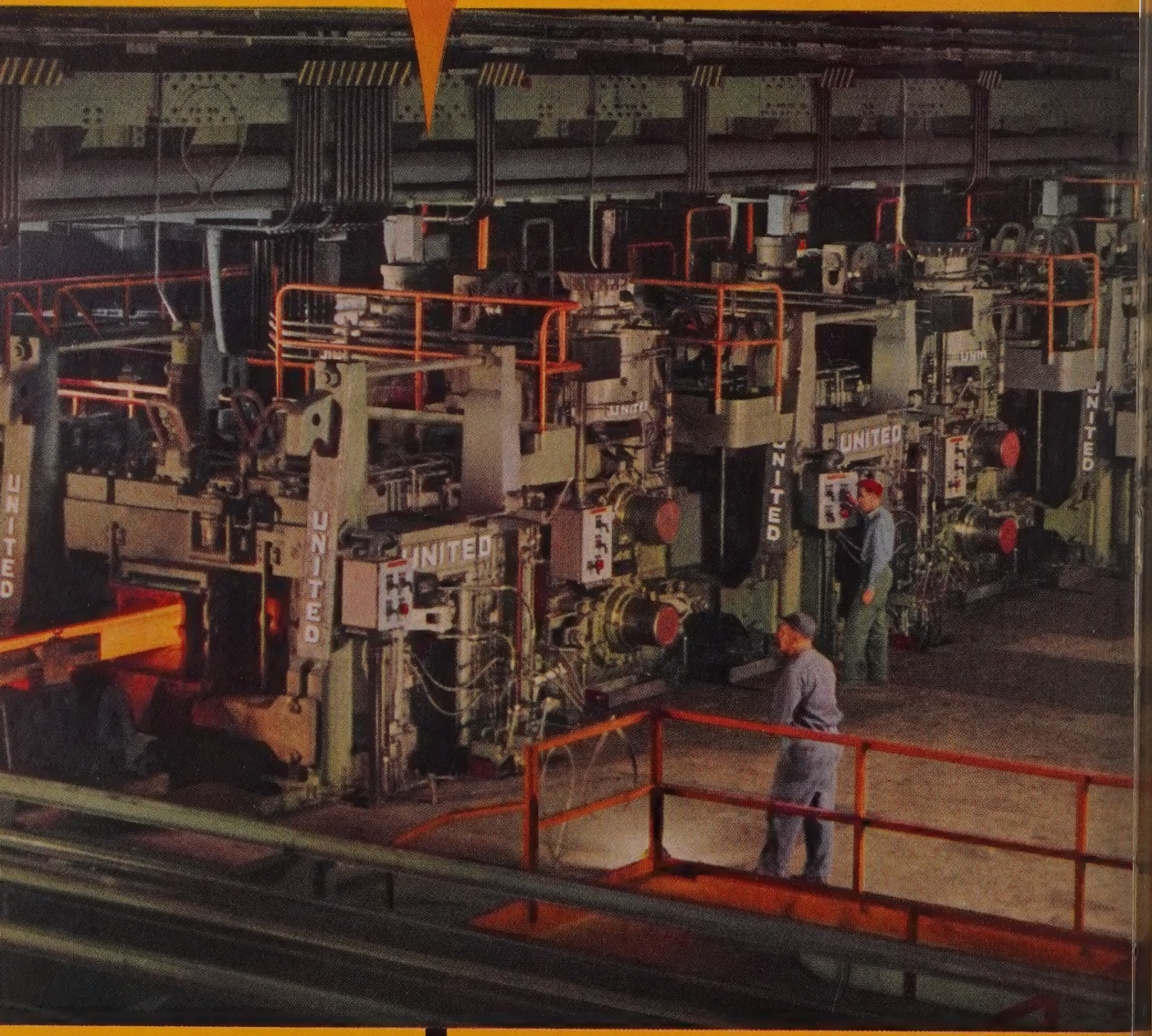

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Here are 5 basic ways to finish aluminum ..for product protection and appearance

Aluminum, in its natural state, never rusts and resists the most common causes of corrosion. However, finishes can provide added corrosion protection, act as a barrier against abrasion and wear, and enhance the beauty of aluminum as well. Following are some of the most popular and effective methods of finishing aluminum surfaces.

Mechanical Finishes, used to add surface texture, include grinding, polishing, buffing, blasting and scratch finishing. Buffing and polishing add reflectivity; blasting and scratch finishing provide a matte finish.

Chemical Finishes for visual effects and product protection are made with caustic and acid etches, chemical brighteners, phosphate conversion coatings and chromate conversion coatings. Chemical brightening creates specular finishes; caustic and acid etches form matte finishes; phosphate and chromate conversion coatings are used to provide a base for paint and added corrosion protection.

Electrochemical Finishes include electropolishing, electrobrightening, plating and anodizing. Electropolishing and electrobrightening levels the surface of metals and creates a more specular finish. Plating is used to create special metallic effects, and produces surfaces where good electric contacts can be made. It has found wide use in the electrical industry. Anodized finishes are created by treating the metal anodically in electrolytes. This method creates a thin, hard and durable film of aluminum oxide on the surface. Clear or colored, anodized surfaces provide excellent abrasion and corrosion protection while enhancing the appearance of the metal surface.

Organic Coatings include the very economical alkyd-amines; the flexible vinyls; epoxy finishes for acid and/or alkali resistance; acrylic for general protection; low cost butrate for long coating life; air drying methacrylate; and silicone alkyds that withstand temperatures as high as 1000°F.

Porcelain Enamel Finishes are vitreous or glass compositions fused to the metal surface. Extremely useful as an attractive, low-maintenance and protective coating for architectural panels, building trim, store fronts, appliance parts and products subject to weathering and use. Luster and color can be easily controlled, and resistance to impact and shock is high. These finishes will actually add more rigidity to the metal base.

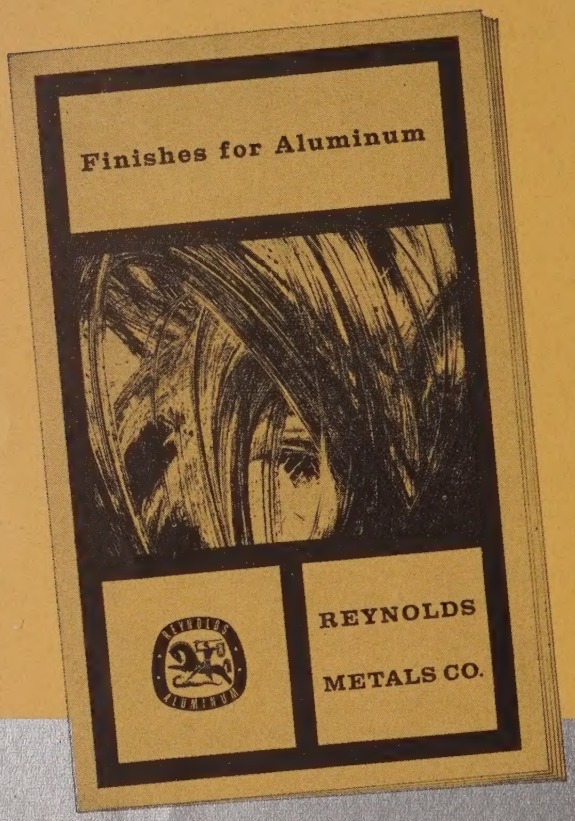
Write for the Reynolds booklet offered on the next page or contact Reynolds Engineering Service, for complete information and advice.

Watch Reynolds TV Shows—"ALL STAR GOLF" and "ADVENTURES IN PARADISE"—ABC-TV

And, to be sure you get the right aluminum—use Reynolds Aluminum

FREE booklet on Finishes for Aluminum—see *next page* ⟶

Finishes for Aluminum



New Reynolds Handbook helps you select the best finishing process for your product

This new handbook describes the most popular surface finishes used on aluminum. Finish characteristics and processes employed are also explained in detail. Designed to provide information you need to select the best finish for a particular application, this booklet is offered free of charge, as part of the Reynolds Aluminum Technical Service program.

For further information on aluminum, aluminum finishes, and aluminum applications, contact your nearby Reynolds Sales Office, or write to *Reynolds Metals Company, P. O. Box 2346-KL, Richmond 18, Virginia.*

Order your FREE copy of this informative booklet today!

CONTENTS:

- Cleaning Treatment
- Mechanical Finishes
- Chemical Finishes
- Anodized Finishes
- Organic Coatings
- Porcelain Enamel Finishes
- Finishing Costs
- Diagrams and Flow Charts

Reynolds Metals Company, P. O. Box 2346-KL, Richmond 18, Virginia

Please send me your new handbook, "Finishes for Aluminum" at once.

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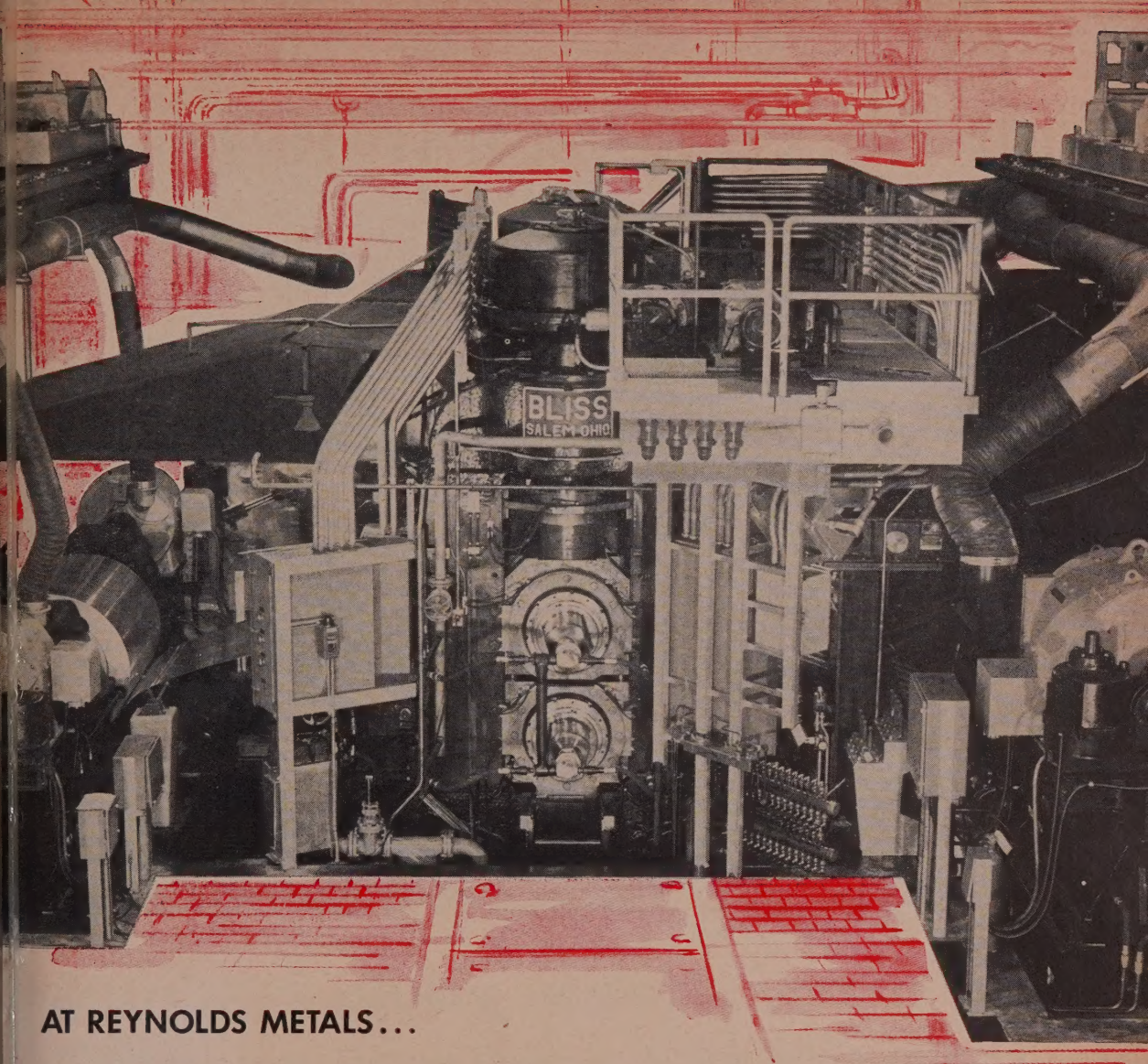

AT REYNOLDS METALS...

Unusual new Bliss mill helps meet growing demand for bright aluminum strip

First of its kind to be installed by Reynolds Metals Company for sheet operations, this new Bliss two-high cold reduction mill recently went into operation at Reynolds' Alloys Plant, near Sheffield, Ala.

A 66-inch mill capable of speeds up to 1000 fpm and reductions as high as 50%, the new mill has been especially designed for rolling bright aluminum strip, now being used in increasing quantities for both decorative and structural applications by the automotive, aeronautical, trailer and other industries.

Among the unusual design features built into the mill by Bliss' Rolling Mill Division are a continuous line flow coolant filtration system and a special heating arrangement that maintains the proper shape of the rolls. Electronic controls provide gage consistency in high speed acceleration and deceleration, as well as permitting the operator to detect difficulties at any point in the rolling operation from his position at the control panel.

According to Reynolds Metals, the new Bliss mill is part of a $65,000,000 expansion and modernization program now going on at the Alloys Plant.

For more examples of Bliss rolling mill and accessory equipment currently in use in both ferrous and nonferrous rolling plants, write us today for your complimentary copy of our new 84-page Rolling Mill Brochure, Bulletin 40-B.

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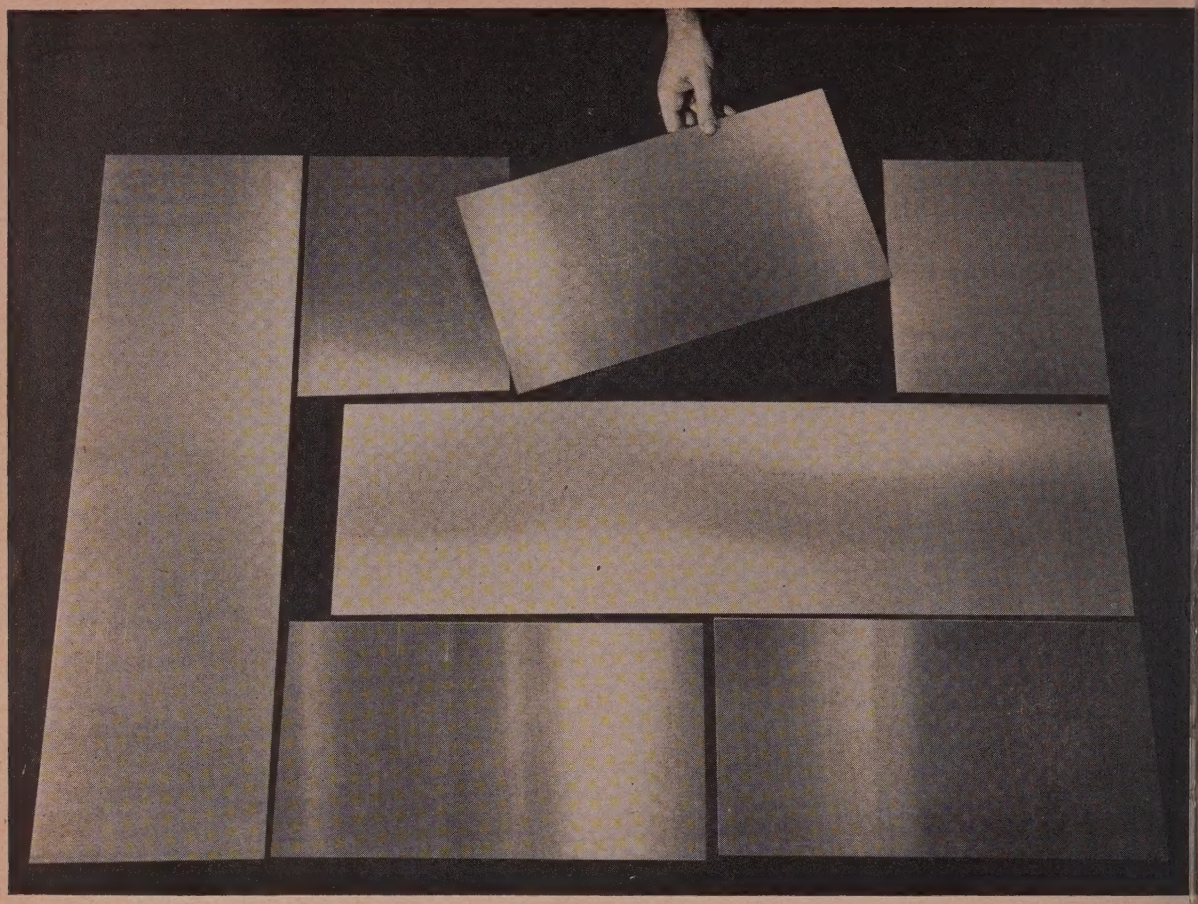

How many sheets could you make from today's waste aluminum?

If you tend to shrug off scrap as an unavoidable business loss, here's a plan that can change your thinking. It's the Ryerson Aluminum Sheet Plan that makes exact lengths and widths available to most users—generally on a *net weight basis.*

Under this plan, you order the exact sizes you need for your production runs—and Ryerson produces them quickly from coil stock on the most modern and accurate slitters and cut-to-length lines. You thus avoid buying metal that you cannot use . . . save the time and labor of processing within your own plant. And in addition, Ryerson can schedule deliveries to match your production pace, enabling you to convert storage space to more productive use and release capital tied up in inventories.

Here you'll find the widest selection of alloys, tempers and thicknesses plus expert technical help on selection and fabrication problems. So ask your Ryerson representative to review your production requirements with you and show you how to eliminate your scrap problems immediately.

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MODERN METALS

Read in companies that produce, fabricate and cast aluminum, magnesium and titanium, and firms that use these metals in manufacturing end products.

N THE COVER: It's hard to believe, but
e Army's new T-195 self-propelled 105mm
witzer pictured on this issue's front cover
amphibious and air transportable. Thus,
e advantage of high mobility is added to
it of heavy fire power. Seven tons of
uctural aluminum designed into the
195 explain this achievement — only a
all part of the Army's sweeping redesign
gram for all types of military gear. The
y begins on page 36.

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Modern Metals

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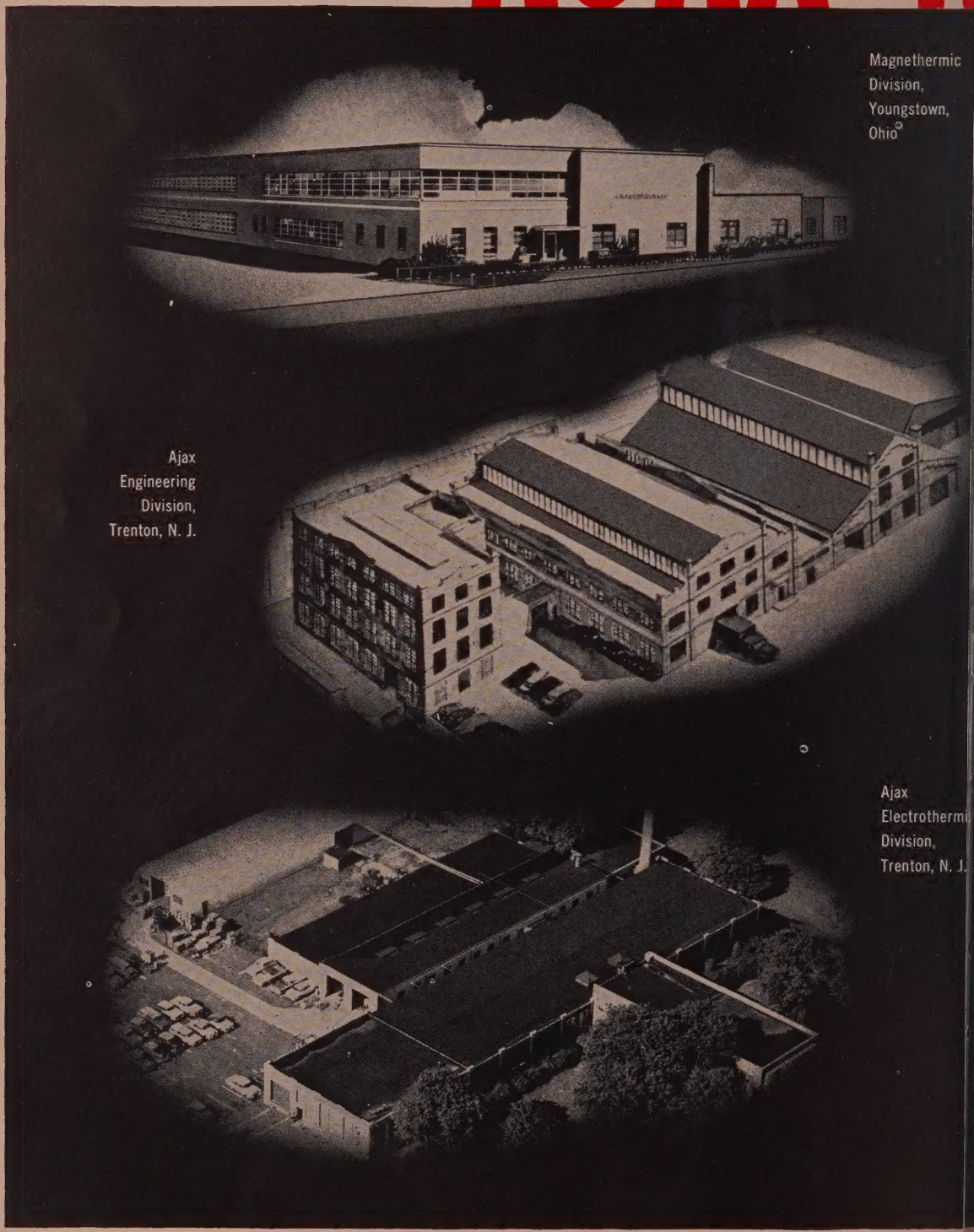
Our name is NEW!

AJAX M



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John A. Logan
PRESIDENT

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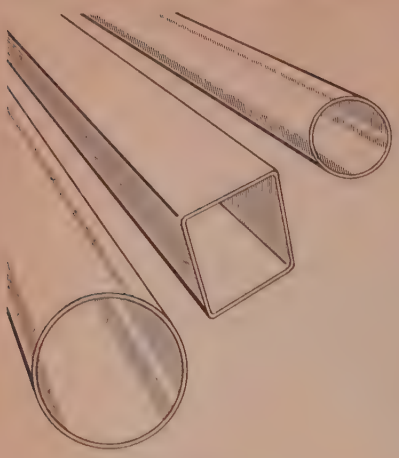

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Letters

Man-of-Year

Sirs:

I suggest that you name as your light metals man-of-the year, the union leaders who let the aluminum producers keep operating without a contract throughout the steel strike. They certainly helped the aluminum industry. . . .

"J" — Pennsylvania

MM—You're right.

Maybe it should be USW's Dave McDonald, or the copper fellas who kept the price high enough to let more aluminum move in on their markets.

If anyone has a good nominee for the light metals man-of-the-year, fill us in.

How To Finish Aluminum

Sirs:

My heartiest congratulations on your very wonderful September issue. I am going to hang on to this issue for a long time — it is a real bible on "How to Finish Aluminum." . . .

"W" — California

Sirs:

Congratulations on your fine article on "Anodizing and Plating Aluminum" in the September issue. This is very interesting to us.

We would like to have 40 reprints of this article for distribution to our salesmen. Naturally, we will be happy to pay whatever charges are incurred. . . .

"W" — Michigan

Sirs:

. . . superb treatment of an important subject. Please send us 10 copies. . . .

"B" — Illinois

MM — Requests for extra copies of our September issue ("How to Finish Aluminum") are pouring in, and our supply of copies is dwindling fast.

In case you missed it, this issue was devoted entirely to cleaning and finishing methods for aluminum. Separate sections dealt with cleaning, mechanical finishing, chemical finishing, anodizing and plating, organic coatings, and porcelain enameling. There was also a summary of the results of our aluminum finishing survey, and a list of major suppliers of cleaning and finishing materials, equipment and services.

Plans are underway to reprint the whole works. The 36-page "manual" will be available for 50c a copy.

Want To Make A Baby Stroller

Sirs:

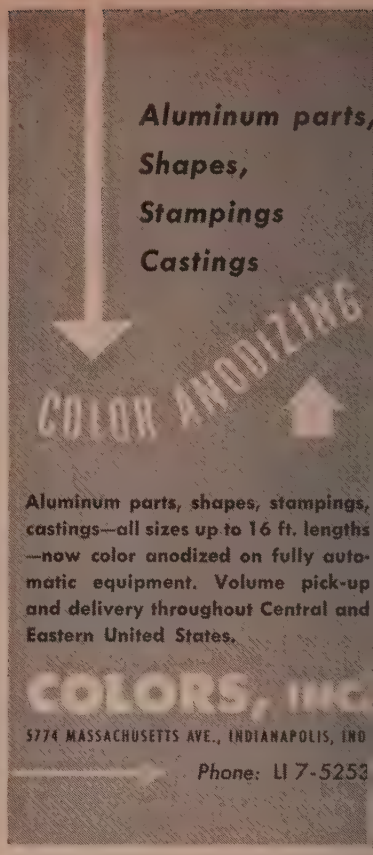
I am seeking a manufacturer with distribution connections who would be interested in producing a new auto and play chair for children from 3 months to 3 years with the additional feature that it can be locked into a wheeled frame to form a stroller.

The design of the unit has a modernistic appearance because of the extensive use of aluminum tubing. Fabrication is simple and requires only bending and drilling operations. The chair and stroller are fully protected by patent applications.

If any of your readers would be interested in obtaining additional information, their inquiries on company letterheads will be considered.

"C" — Missouri

MM — Sounds like a saleable product. If



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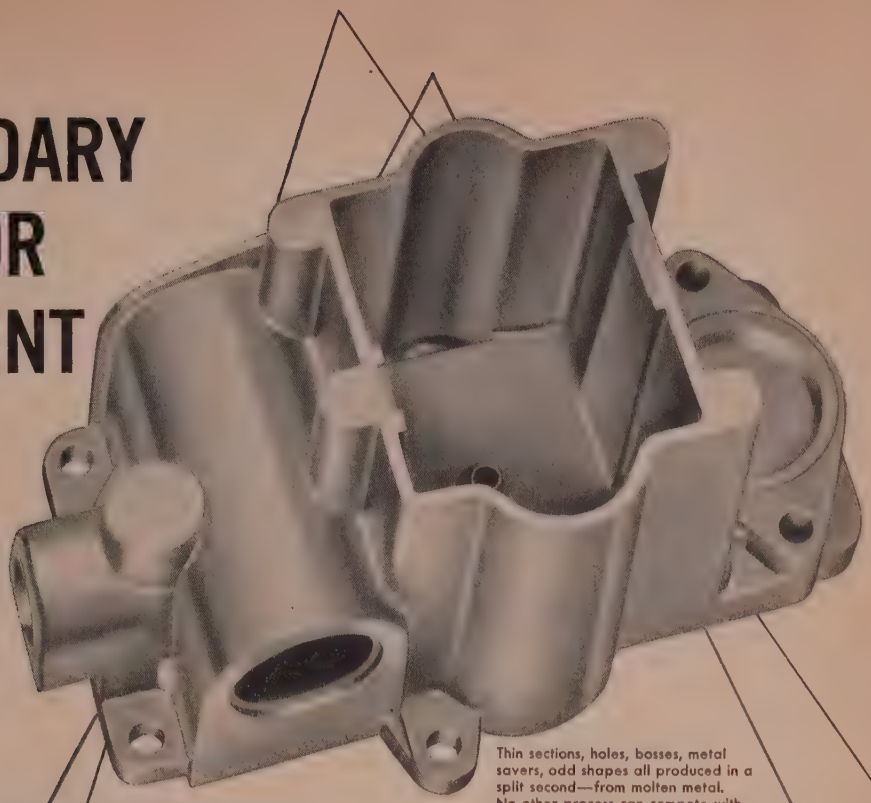

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Seek challenging position at Superintendent level or above. Age 39; good health; free to relocate.

Write Box No. 1010, Modern Metals, 435 N. Michigan Ave., Chicago 11, Ill.

ALUMINUM CASTING SUPERINTENDENT WANTED

Growing diversified company in Northern Indiana lakes region needs experienced, aggressive man to establish and operate new aluminum permanent mold foundry.

Technical and administrative ability essential. Age 30 to 50.

Write full details in first letter to Personnel Manager, The Dalton Foundries, Inc., P. O. Box 110, Warsaw, Ind.

anybody wants to contact Mr. "C" we'll be glad to forward your letter.

About Cryogenics . . .

Sirs:

We are desirous of information concerning cryogenic equipment, and metals used in their fabrication. We understand that you published a report concerning a big market for aluminum in the manufacture of cryogenic equipment in the August 1958 issue of MODERN METALS. I have been unable to locate a copy of this issue in our library.

We would sincerely appreciate a reprint of this article.

"D" — California

MM — Reprint sent.

The prospects for aluminum in cryogenic (ultra-low temperature) equipment look brighter every day. Seems that aluminum's properties actually improve at the super-low temperatures of liquefied gases, while many other metals become brittle. Aluminum fabricators are well advised to keep an eye on this growth market.

Magnesium Bowling Pins

Sirs:

The May issue of MODERN METALS had an article on Page 81 stating that magnesium permanent mold cast models are being used as a substitute for wood in one of our nation's leading sports.

Would this application be bowling pins? In that this article was released in May, there no doubt is additional history regarding this project. Would you pass on any information which is available?

"C" — Ohio

MM — You guessed right, but there's not much more to be reported on the subject of magnesium bowling pins (see the "Here & There" item on page 20 of this issue).

As far as we know, the mag pins perform as well as maple pins, and there are no serious problems with magnesium. The mag pins simply last too long, however, and would practically wipe out the lush replacement market.

Weathervane Source

Sirs:

We notice in your "Letters" column an inquiry from "L" in New York for a manufacturer of aluminum weathervanes.

The obvious interest as indicated is a pleasure to note. We have been making aluminum weathervanes here in Spokane for over two years but our distribution has been limited to the State of Washington for the simple reason we have not previously had an opportunity to expand elsewhere. We would very much appreciate having any number of inquiries and feel certain we are in a position to supply the best value in a weathervane that is on the market.

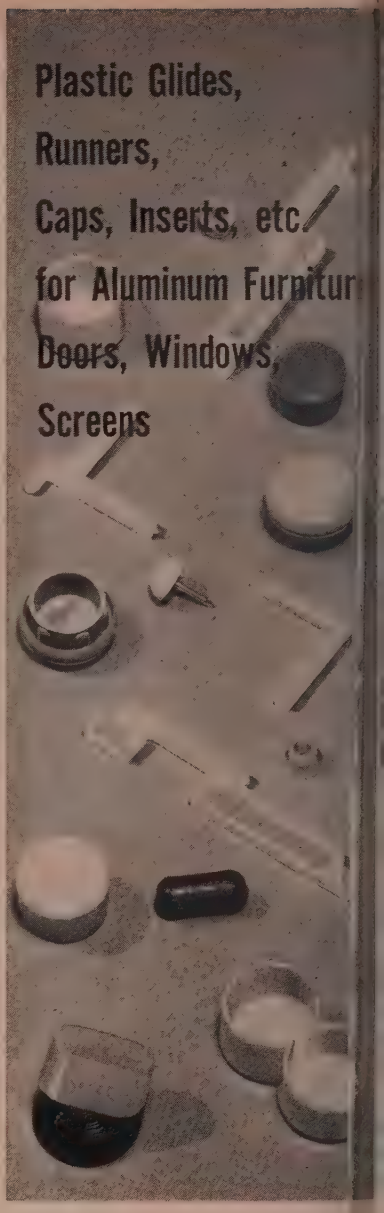
We are presently producing three patterns; a horse, a dog, and a rooster. Our vane is absolutely trouble free and completely guaranteed.

"S" — Washington

MM — This reply, from Nelco Products Co. of Spokane, is but one of a dozen answers from manufacturers of weathervanes. This letter resulted from our plea for an aluminum weathervane source in the July issue.

All have been forwarded to the firm seeking a source.

Last month we asked if any reader manufactured crosses for graves for a man who obviously is in that kind of business. Not only does Mr. "M" of Illinois know where to get all types of crosses, but we were amazed at the number of cross manufacturers that replied.



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DOW MAGNESIUM PRODUCTS

ARE YOU GETTING ALL THESE BENEFITS WITH YOUR MAGNESIUM CASTINGS?

low magnesium foundry offers experience, production capacity for sand and permanent mold castings of all sizes and shapes.

he unique capabilities of Dow's Bay ity, Michigan, foundry help users of agnesium sand and permanent mold astings. Activities at this facility—rgest and best equipped of its kind run the gamut from large volume oduction jobs to one-shot "specials".

uge or tiny castings. The foundry is apable of producing castings weigh-g in excess of 3,000 lbs. down to inces—in all degrees of complexity. xperienced pattern engineers ensure at the best use of casting processes made. This can result in either lower sts, improved quality, better deliveries, a combination of all three.

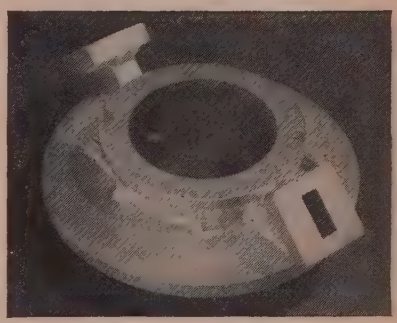
ewest techniques. Many milestones in agnesium casting have been reached this Dow foundry. In fact, Bay City s men permanently assigned to devel-mental work, keeping the foundry the forefront of technological ad-nces at all times.

sults of their work include special ocesses for cast-in inserts and tubeless ssages, and improved melting tech-ques. Casting methods have been de-oped for many of the newer mag-sium alloys, such as the elevated temperature group and the new high damping capacity alloy, K1A.

Quality control. A full time quality control team exhaustively checks all work, from alloy composition to the shipping dock. A direct-reading spectrometer makes rapid alloy composition analyses. Its speed is particularly valuable when alloying elements that are hard to hold in the molten state, such as thorium, are present. Chemical analysis is also frequently employed.

Testing facilities. Molding and sand cores are analyzed as a regular part of casting quality control. Radiography, fluorescent penetrant inspection and other testing facilities are used to check properties and specifications.

Experienced magnesium team. The foundry often draws upon the broad range of specialized experience available throughout the company. To Bay City customers, this means assurance of high quality work, done with utmost efficiency and economy. If your requirements involve magnesium castings, Dow can help you arrive at optimum casting design and reliably supply your production requirements.



THIS SAND CAST WAVE GUIDE was held to ±.005" on passageway dimensions. Surface smoothness requirements are 63 RMS. The foundry has government approval for any phases of its operations where such approvals are applicable.

THIS BRAKE CARRIER is sectioned to show how the hydraulic lines were integrated by use of tubeless passageway casting techniques.

WRITE TODAY for this illustrated brochure discussing Dow foundry services. THE DOW METAL PRODUCTS COMPANY, Midland, Michigan, Sales Dept. 1303CQ10.

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Here and There

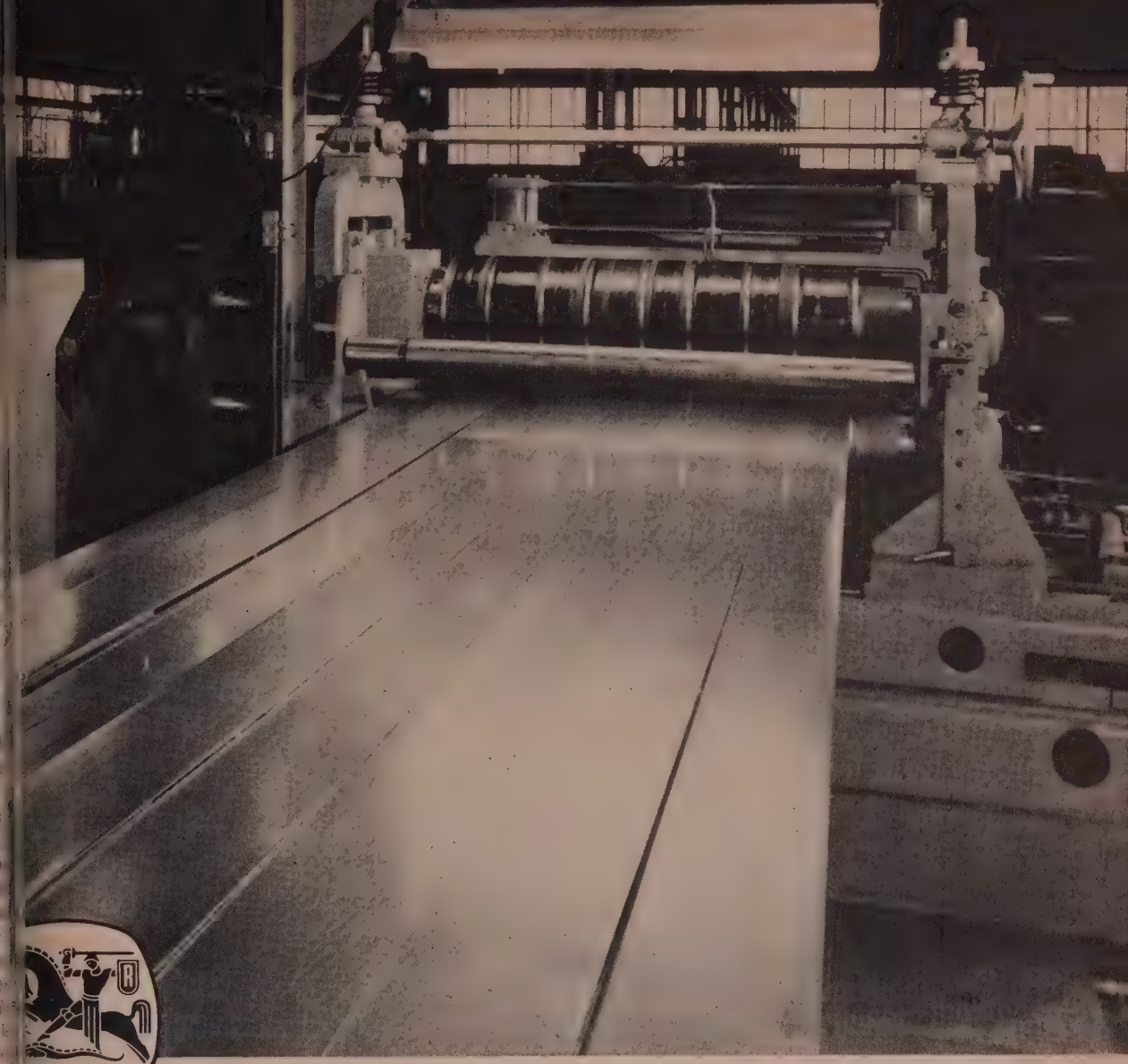
Great Replacement Year » » Appliance manufacturers and retailers agree that the industry is headed into a strong replacement market that is still expanding. Record sales in 1950—6.2 million refrigerators, 7.5 million TVs—might again be approached, but the strength of the market is apparent right across the board, including home laundry equipment, air conditioners and kitchen ranges. The steel strike, of course, could nip this selling spree. Already, some of the big manufacturers have had to lay off plant help. In spite of this outlook, the industry thinks 1959 will be one of the best years they've had.

Far East Mission » » To bring western aluminum fabricating savvy to Japan, Aluminium Limited has signed a 15-year agreement to give technical help to Kobe Steel Works. If we know the Japanese, they'll learn all there is to know about aluminum rolling, extruding, casting, rod rolling, wire drawing and other techniques long before the pact has expired. Kobe Steel will buy some of its aluminum from Limited's International Aluminium Co.; will also pay the cost of technical assistance, as well as royalties on the sales value of increased production.

Kaiser Looks Abroad » » While Alcoa and Reynolds have been reaping headlines concerning their aluminum activities overseas, Kaiser Aluminum has been laboring quietly to strengthen its position in Africa, Europe, India and South America. With an eye on the European Common Market, Kaiser Aluminum International has set up a sales office in Zurich, Switzerland, and worked out an arrangement with Spanish interests and France's Pechiney concerning three aluminum plants — a 5000 metric ton reduction works, a sheet mill, and a castings plant. Majority ownership of all three is Spanish. The smelter and sheet mill are being expanded and a 12,000 ton reduction plant being built in northern Spain is scheduled to start operating in 1960. Kaiser has also joined forces with G. D. Birla, one of India's top industrialists, to establish the Hindustan Aluminum Corp., which will build and operate a 20,000 metric ton reduction plant in Central India. Kaiser holds a 27% interest in the venture. Other areas in which Kaiser is active include Ghana, Africa, where ambitious aluminum plans are being laid, and Argentina, which has been making eyes at the U. S. aluminum industry. A new Kaiser sales office in Buenos Aires will direct sales activities in seven South American countries.

More Push Per Pound » » Aluminum has become a vital element in high performance solid propellants for rockets and missiles. Atlantic Research Corp. has publicized a new aluminized solid fuel propellant which increases thrust 10-30%. Thiokol Chemical, Aerojet-General, and other propellant makers are also working on aluminized fuels. In the past, the use of high energy metal powders (titanium, zirconium and alumium) has been hampered by their tendency

(*Continued on page* 20)



Typical aluminum slitting operation at a J & L Steel Warehouse.

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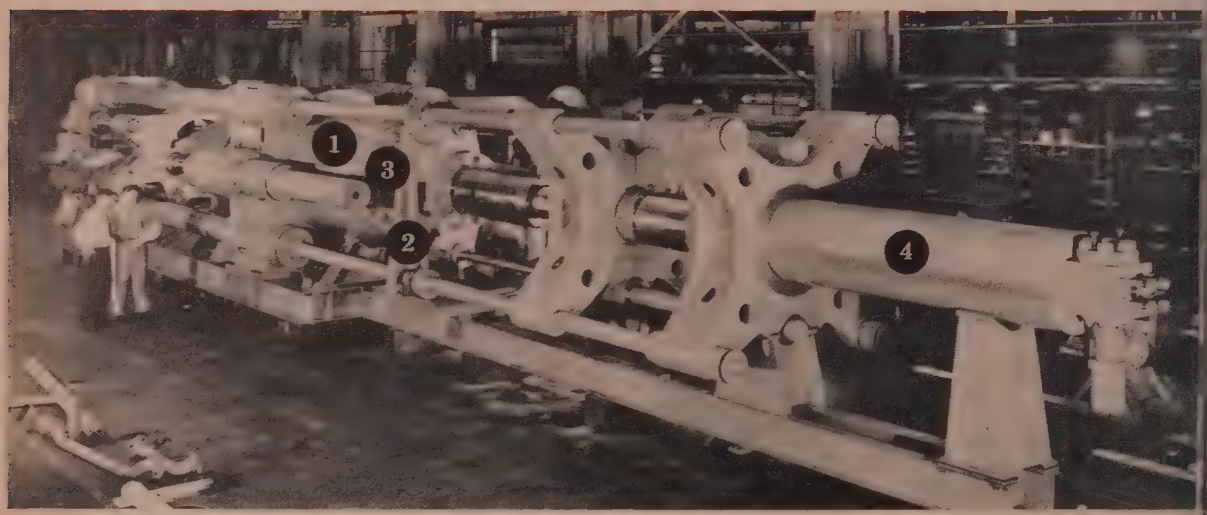
The precise reasons why Loewy extrusion presses offer the maximum in production, economy, endurance, flexibility



3000-ton-capacity water-hydraulic extrusion press with independent external piercing device

1. Inserted forged steel main cylinder
2. Simultaneous setting of stop nuts by chain attachment mandrel arresting device
3. Prefill valve connector of patented design
4. Inserted forged steel piercer cylinder

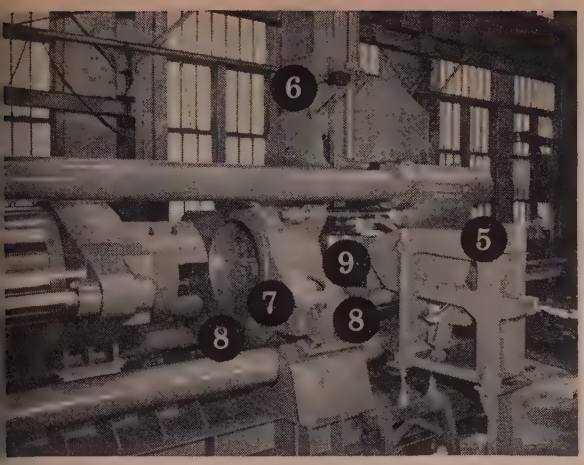
Many of the outstanding features of Loewy extrusion presses are a result of anticipating the needs of our customers. Others, of course, stem from special designs made to satisfy the requirements of a specific client. The principle of changing basic designs to meet individual requests has resulted in presses that offer maximum production, economy, endurance and flexibility.

Loewy presses can handle all extrudible metals and alloys. They allow a combination of the variable operating conditions of pressure, speed, temperature and billet size needed for a perfect product. They are, moreover, built for the utmost economy of man-hours, cycle time, horsepower, maintenance and floor space.

In our designs, pushbutton automatic control has been developed to the highest degree of functional perfection. Extrusion speed adjustment, billet, dummy and clea- out disc handling, die change and rotation—all can e fully mechanized.

Rigid welded steel construction insures utmost pre sion in alignment and, where tubular products are co cerned, highest concentricity. One-piece design of lar components prevents warping at high operating tempe tures. Auxiliary movements are provided with indepen ent pressure supply.

The pictorial story presented here sets forth some of e features of Loewy extrusion presses, all of which are product of many years' study, research and developme And many other important advances are currently in the making. For detailed information, write Dept. D-



)00-ton-capacity self-contained oil-hydraulic extrusion press

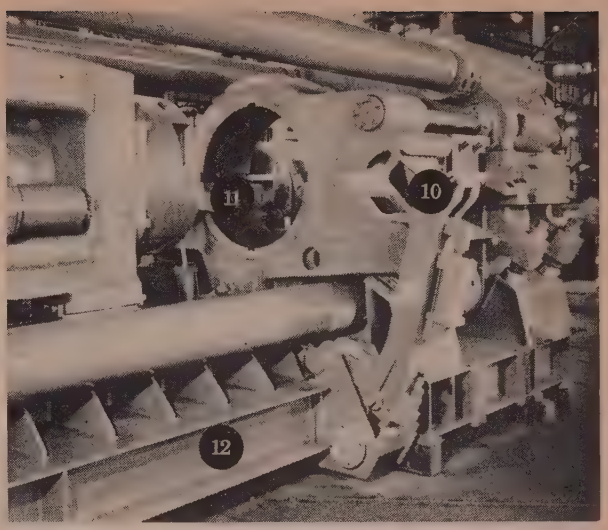
Mechanized die-changing device permitting use of several dies rotation without manual die changing and without interrup-)n in main press cycle

Vertical sliding butt saw with oil-hydraulic feed control

Movable container holder of one-piece design that will not ırp under influence of heat

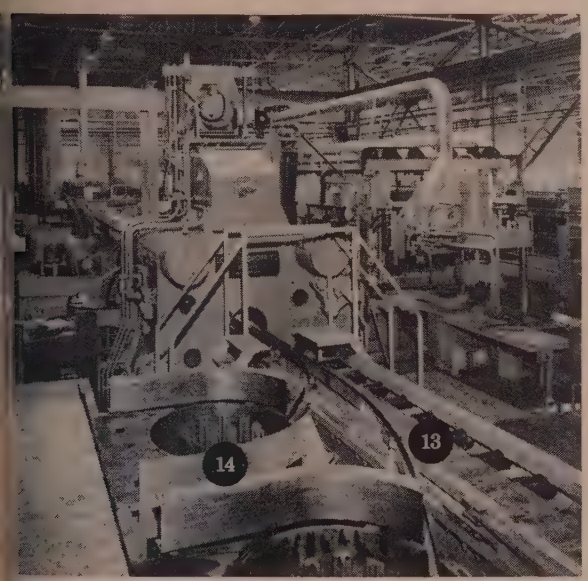
Adjustment that insures concentric alignment

Lateral die slide, hydraulically operated, with two stations for assembly and for removal of butt and shell



3000-ton-capacity water-hydraulic extrusion press with internal piercing device

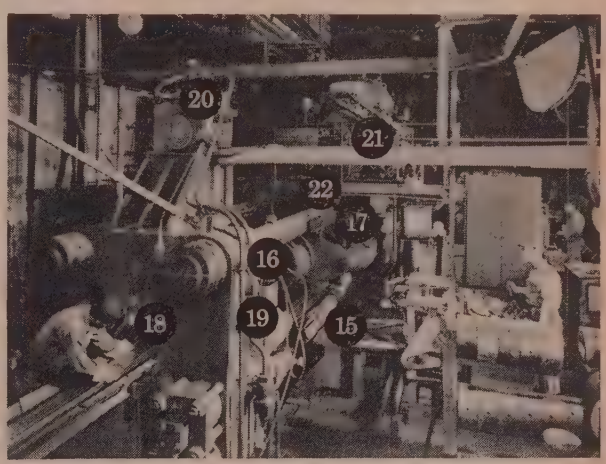
10. Billet loader of robust pivot-arm design
11. Cleanout disc loading device mounted in front of container
12. Base frame—one-piece design of rigid welded construction that facilitates alignment of press assembly



)0-ton-capacity water-hydraulic extrusion press

Mechanization of run-out side of press for straight solid and ular extrusion

Double coiler designed for the wire rod to be received near outlet of the press



2200-ton self-contained oil-hydraulic extrusion press

15. Simple, easily adjustable billet loading device
16. Container holder designed to permit fast change of container, which can be removed on return press stroke
17. Ram speed indicator
18. Large platen hole for ease of access to emerging extrusions
19. Heavy-walled pipes rigidly supported to cut vibrations, leaks
20. Powerful, rigidly constructed shear
21. Large oil reservoir for minimum operating temperature
22. Full-size catwalk for ease of maintenance

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All About . . .

ALUMINUM IN BUILDING

The November issue of Modern Metals will feature new and significant developments in the use of aluminum in the building and construction industries. Here's a summary of some of the feature articles;

BUILDING PRODUCT MAKERS SAY . . .

A Modern Metals survey of nearly a thousand product manufacturers—how they assess the 1960 outlook; what they have planned for aluminum; what they think should be done to bolster aluminum's position in the building field; how much aluminum they expect to use next year.

NATIONAL HOMES BANKS ON ALUMINUM

The world's largest prefabricated home manufacturer racked up such outstanding success with its 1959 aluminum Viking that it's counting on an expanded aluminum line to offset next year's tougher market. The new aluminum applications are detailed in this report.

NO-GLARE ALUMINUM SCREENS

How one of the biggest makers of [illegible] solved the [illegible] problem, and gave aluminum a competitive advantage over Fiberglas and other materials.

TO PROTECT ALUMINUM WHILE BUILDING . . .

How aluminum wall systems and windows were insulated against staining, abrasion and plaster damage during shipping and erection of a new missile plant.

ALUMINUM'S GAINING IN EUROPE

A special report on the "Aluminum in Building" symposium [illegible] in England by the Aluminum Development Association. Subjects covered include curtain walls, finishes for aluminum in building, aluminum in roofing, aluminum in prefabricated and transportable buildings.

These are only a few of the informative features scheduled for November. To be sure of getting your copy, fill in the subscription form below and send it today . . .

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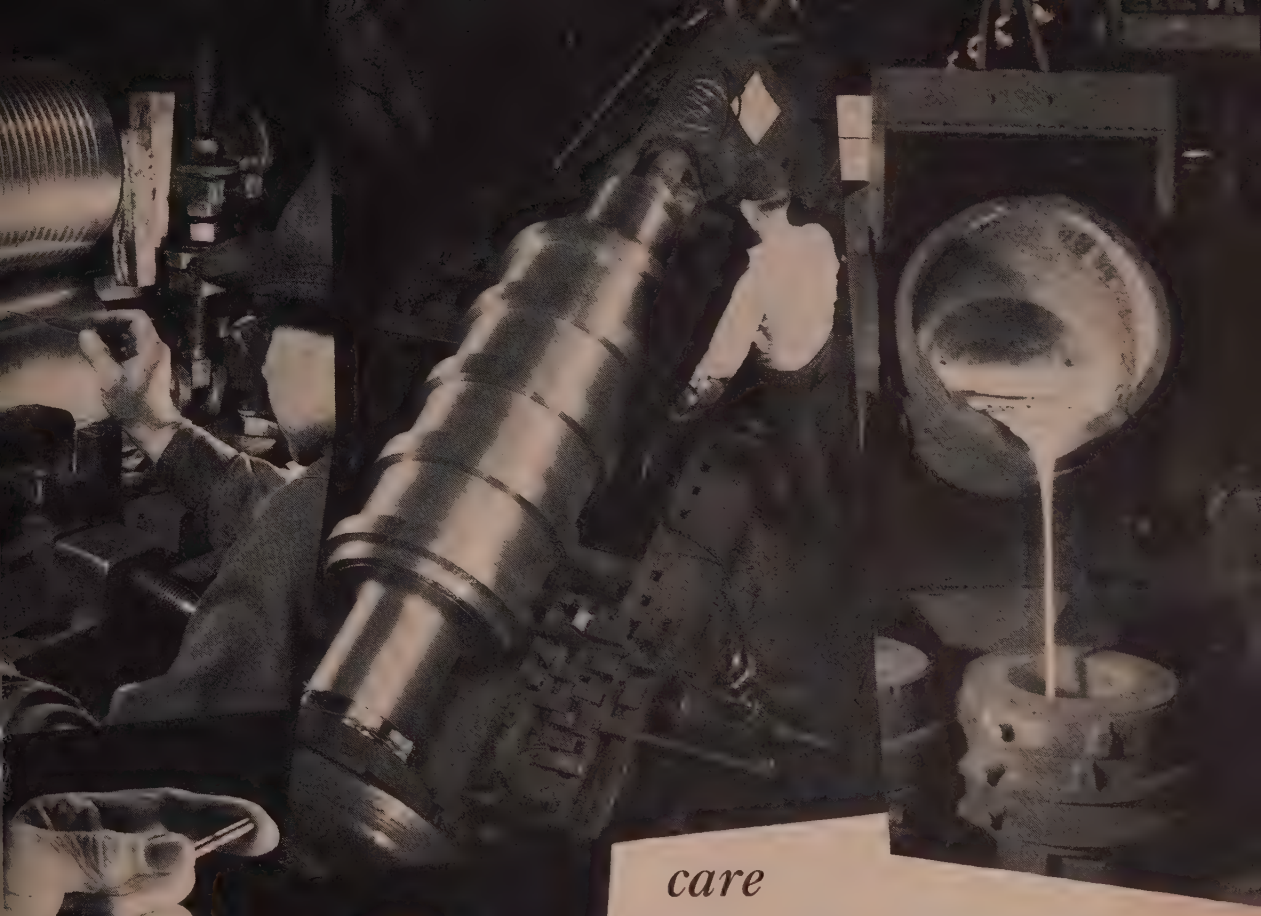
ignite prematurely. This problem is being licked [illegible] coating (encapsulating) the aluminum particles. T[illegible] prevents premature reaction and gives missiles a long[illegible] shelf-life than possible with liquid fuels. Another n[illegible] twist is the use of an aluminum coating on other so[illegible] fuel particles. Minuteman, Polaris and Nike Zeus [illegible] among the missiles that are said to use aluminized fu[illegible]

Hope We're Wrong » » Earlier this year, we [illegible] ported some efforts to develop a magnesium bowl[illegible] pin. Our informant said that a regulation pin m[illegible] of magnesium can't be distinguished from the offi[illegible] wooden pin once it's coated with plastic. Maple [illegible] becoming more and more costly, and the service [illegible] of maple pins has been shortened greatly by autom[illegible] pin setting machines. Everything would seem to fa[illegible] magnesium bowling pins. Our informant said t[illegible] have proved that scoring patterns are unchanged w[illegible] magnesium pins, and weight, shape and resiliency [illegible] the same. But the American Bowling Congress pr[illegible] ers) withholds its judgement until it has staged [illegible] own tests. "In the final analysis," said ABC, "the b[illegible] lers themselves will be the judge of any new produ[illegible] Our mournful guess is that it will be many years be[illegible] magnesium makes the grade in this volume applica[illegible] For one thing, magnesium pins don't make the fami[illegible] clattering noise when you roll a strike. What bo[illegible] would be content with any other sound?

Aid for the Baking Industry » » After sur[illegible] ing baked goods sales, Reynolds Metals Co., a[illegible] promoters of aluminum foil applications, concl[illegible] that bakeries are losing out to other supermarket [illegible] purchases in the daily battle for the shopper's do[illegible] So Reynolds has organized a baking industry pac[illegible] ing group "to give bakers increased benefits from (R[illegible] nold's) extensive bakery merchandising and packa[illegible] research. . . ." The increasingly discerning middl[illegible] come consumer is looking for the same marks of qu[illegible] in bakery packaging that he sees in other foods; [illegible] cording to Reynolds. "Our studies indicate that [illegible] bakery packaging now suffers from a monoton[illegible] color and weak package design," said Merrill [illegible] Grogel, chief of the new market group. "This [illegible] baked goods at a severe merchandising disadvanta[illegible] So Reynolds is experimenting with color dyna[illegible] to departmentalize supermarket bakery sections [illegible] make baked goods shopping "as exciting as shop[illegible] for frozen foods, dry mixes and detergents is to[illegible] On Reynolds' drawing boards are a number of i[illegible] that will impart a "quality look," greater eye-a[illegible] and longer shelf-life to baked goods, as well as red[illegible] costs to the bakery.

World Aluminum Production » » Twenty [illegible] nations produced a total of 3,890,000,000 short to[illegible] aluminum last year, the Bureau of Mines report[illegible] 1957, total production was an estimated 3,725,00[illegible] tons. The U. S. produced 1,565,557 tons in '58—8[illegible] tons below its '57 production. Canada, on the [illegible] hand, boosted output from 557,105 tons in 19[illegible] 646,000 tons in '58. Russia's output climbed [illegible] 550,000 to 605,000 tons, while Norway's rose [illegible] 105,434 to 134,021 tons.



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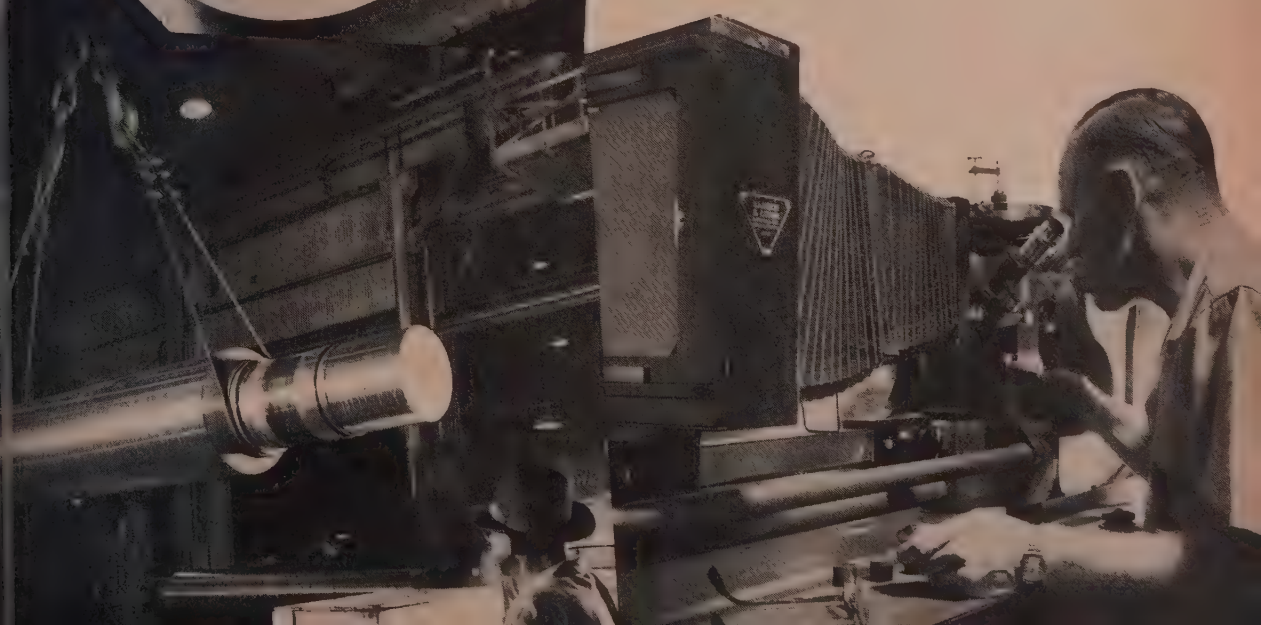


New Enterprise

A Holiday House that floats is a new product being manufactured by Richland Manufacturing Co., Richland, Mo. It's built atop a heavy gauge aluminum hull, and contains aluminum siding, windows, doors, etc. Up to six people can live aboard. Aluminum construction permits a 7-inch draft for navigation in shallow waters.

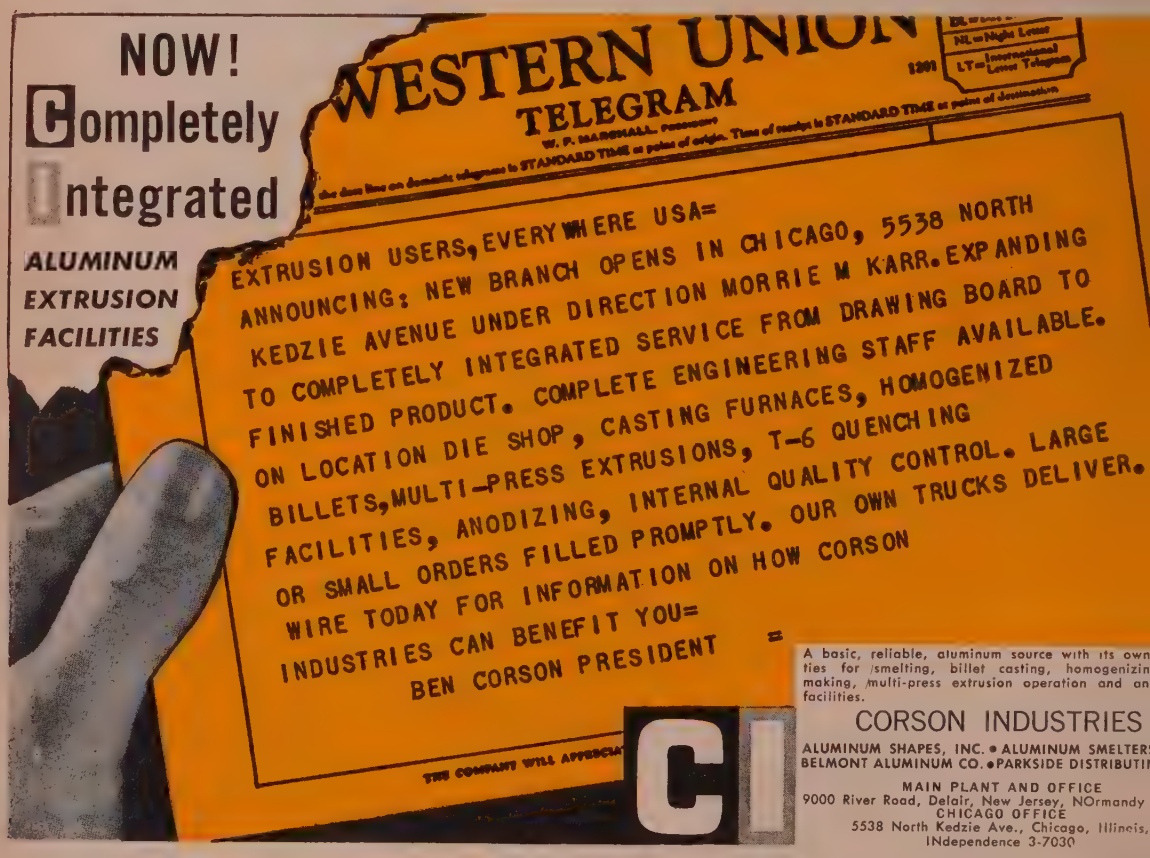
A new industry is building up around the manufacture of **aluminum cargo containers** for use in air, water, or land transportation. This is an application that will grow for years. One new container for air cargo is being made by Jeta Metal Fabricators, Inc., Yonkers 2, N. Y. Having a load capacity of 5000 pounds and weighing 230 pounds when empty, these containers are 84 inches long, 51 inches wide, and 62 inches high. When collapsed, the height is reduced to 13 inches. It is made entirely of aluminum.

One of the latest adaptations of **aluminum roofing and siding accessories** has been brought out by Kaiser Aluminum & Chemical Corp., Oakland 12, Calif. Products such as ridge roll, ridge cap, endwall flashing, coiled flashing, and green translucent panels are now embossed in a diamond pattern to match Kaiser's Diamond-Rib building sheet. Other products pattern are aluminum nails with embossed hea ribbed sheets measuring 6 to 16 feet long.

Titanium assemblies and corrosion-resistant ment for metal finishing and other applicati now being fabricated by a recently-formed firm canium Corp., 3080 Skokie Valley Highway, Hig Park, Ill. The president of the firm is James K. who has specialized in the development of tit fabrication; believes that their unique techniqu result in more economical utilization of tita corrosion-resistant characteristics.

A former aluminum utensil firm, Advance minum Castings Corp. of Chicago and more re a holding company, has purchased Ross Manufac Co., also of Chicago. The purpose of the acqu is to continue and expand the manufacture o **tronic component parts** used in television rec Advance Aluminum was once known as a larg minum foundry.

The West Coast plant of Kawneer Co. in mond, Calif. has purchased a 2200 ton Sutton ext press which will handle billets up to 9 inches. Ka with headquarters in Niles, Mich., is a major facturer of **store fronts and architectural product** other aluminum extrusion press has been ins on the West Coast by Michael Flynn Manufac Co. at City of Industry, near Los Angeles. This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Alcoa puts the metal where you want it

re than a hundred tons of Douglas DC-8 kiss the run- on forged aluminum wheels like this one. Strength lightness are obvious requirements. Even more es- ial is reliability through landing and after landing uard the safety of passengers and crew.

ogically enough, rugged aluminum forgings were ted for the job. Then came many hours of Alcoa l in die design, demonstrated in the remarkable zebra pes visible in the cross section. They represent the ninum grain flow* and illustrate how the tough alu- um grain is forged to withstand the shock loads of ding impact, plus the cyclic fatigue of rotation, all n a wide margin of safety.

lcoa forges these wheels with a unique combination locker and finishing dies to put the metal exactly re it's needed. Alcoa Alloy 2014-T6 assures excellent hinability for the designer and producer, Bendix ducts Division, Bendix Aviation Corporation. And Alcoa's forging plants, with hydraulic press capacities up to 50,000 tons, provide on-the-nose deliveries.

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**The patterns shown in the illustration were produced in Alcoa's Research Laboratories as part of a study of grain flow developed by the dies used to forge the DC-8 wheel.*

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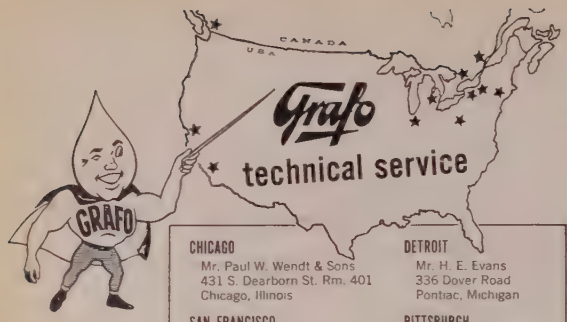

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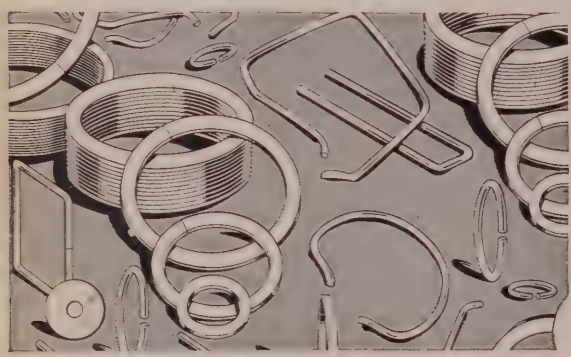

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716 Brazing Wire
713 Brazing Sheet

Write for 16 page booklet *on better brazing*

LUCAS-MILHAUPT *Engineering Co.*
5040 S. Lake Drive • Cudahy, Wis.

pany makes **aluminum windows and curtain walls.**

A new investment casting foundry has been added to the Electronics Division of Gorham Manufacturing Co. of Providence, R. I., manufacturers of silverware. The foundry was erected to produce complex **castings for microwave antennas and components in aluminum**, magnesium and copper alloys. The superintendent of the operation is Edgar I. Gotthold.

With the advent of portable and now enclosed swimming pools, auxiliary equipment for this growing industry is becoming more important. One such firm is Swimquip, Inc. of El Monte, Calif. and Atlanta, Ga. The firm, already a major aluminum user, makes **diving boards, grab rails, fill spouts, valves, and cleaning gear** out of anodized aluminum. In addition, Swimquip makes underwater vacuum cleaners and in all a total of 150 separate swimming pool components, many of them employing aluminum.

It will soon be true that wherever you can buy steel from a metal distributor, you can buy aluminum because the larger steel distributors are increasing their distribution of aluminum into most of their warehouses. For instance, Joseph T. Ryerson and Son has added stocks of aluminum in its Buffalo warehouse, at Charlotte, N.C., in San Francisco, and in Detroit. Ryerson is one of the largest **aluminum distributors** in the country.

A new type automatic humidifier for the home which fits any furnace and bonnet is being manufactured by Auto-Flo Corp., 12085 Dixie St., Detroit 39. The units contain five glass fiber evaporator plates which soak up water quickly and utilize **aluminum foil as stiffeners.** The aluminum foil core also acts as a built-in sacrificial anode.

A new four-inch aluminum box **gutter and downspout system** is now in production by Aluminum Co. of America, Pittsburgh. Available in either standard mill finish or stucco embossed, the systems are adaptable for both original and replacement installations. A new method of hanging and joining eliminates straps, slip joint connectors and miter joints.

Aluminum has invaded the car storage field with equipment which lifts cars to upper story spaces in downtown parking buildings. The **elevator cars and portable frames** are made of aluminum which allow for greater speeds — up to 400 feet per minute. The manufacturer is Bowser Parking System, Inc., 112 S. W. 2nd, Des Moines, Iowa.

Movable aluminum walls are rapidly gaining acceptance. One of the pioneers in this field has come up with what it calls "seven movable wall systems." Walls are fabricated of glass, laminates, wood, and joined by horizontal anodized aluminum extrusions. The Mills Company, 963 Wayside Road, Cleveland 10, manufactures these walls.

Aluminum slugs are being impact extruded on a Herlan press into **speedometer indicator cylinders** for the new Buicks. The manufacturer is A.C. Spark Plug Division of General Motors Corp. at Flint, Mich. Present output is at the rate of 35 parts per minute, and

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the cylinders retain such good finish that polishing ar buffing are eliminated. The finished cylinders are spra painted, and silk screening is used in the finishin process. In this continuous casting process, rejects a held to less than 2%.

More than 500 **aluminum and plastic chairs,** chai lounges and cots are being manufactured in the ne C. M. Jones and Co. rug mill in Calhoun, Ga. The off-season products are being manufactured by one the oldest rug companies in the world to supplemen sales and give continuous employment to its personne The company estimates that the ultimate productio potential is about 5000 units per day. In order get into this new business, the Jones Co. purchase hydraulic benders, automatic cutters, gang drills, stam ing machine, and finishing equipment.

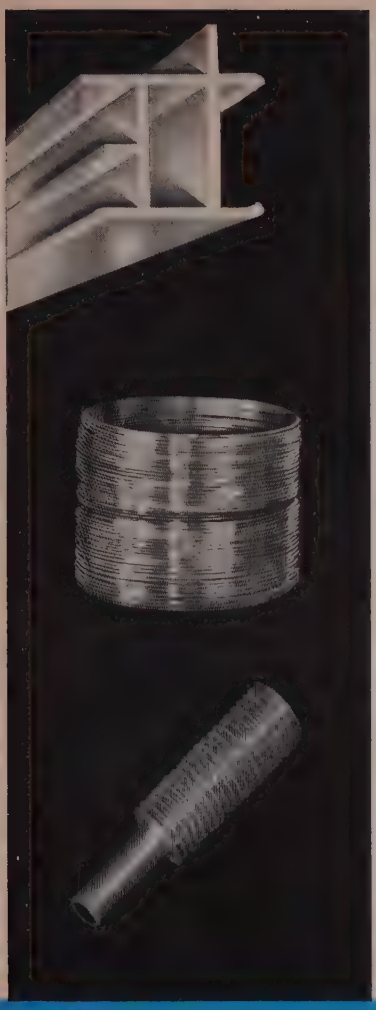
Aluminum identification tags for small parts an components used in the electronics industry are bein made by Permatag, 91 N. Daisy Ave., Pasadena, Cali The one-piece tags, which are 1 inch by 3½ inch complete with a tie-on strip, are said to be easi marked with pencil or ballpoint pen. The weathe proof, low cost tags may be embossed with addition information if large quantities are needed.

The door closer business is growing, and nearly eve new line makes extensive use of aluminum. One suc new product is manufactured by Shelby Spring Hin Co., Shelby, Ohio, an old firm in the hardware gam Its line of **door closers,** which will hold open in an position and have concealed springs, are enclosed a rust-proof aluminum barrel.

One of the largest manufacturers of store fronts an other outdoor building products, Kawneer Co. of Nile Mich., has purchased South Bend Screw Products, In of South Bend, Ind. This plant, which manufactur **fabricated parts for aircraft,** missiles, automotive an appliances, will supply Kawneer with its compone parts. It's another step in Kawneer's long range pr gram of integration and growth, says an official.

Hawaii will soon have its first large **steel and alum num distributor,** when the Earle M. Jorgensen Co. Los Angeles opens a 50,000 square foot warehouse Honolulu early next year. The Jorgensen Co., whi will spend over a million dollars for this new plan feels that the Islands are now big enough to justify o the-spot delivery of basic materials. It will stock pro ucts of some 60 steel mills and also a full line of alum num.

Capable of operating on wet mud, grass, or wat of any depth and at speeds up to 35 mph is a ne **aluminum air boat** being manufactured by Airboa Inc., 3323 N. Florissant Ave., St. Louis, Mo. Hulls o these new boats are constructed from heavy gaug high strength aluminum alloy, and the boat is furth strengthened by using five stringers attached to th bottom of the boat. The 14-foot boat has an aluminu rudder and is powered by a four-cylinder, 65 hp. air craft engine. It can carry four to six passengers.



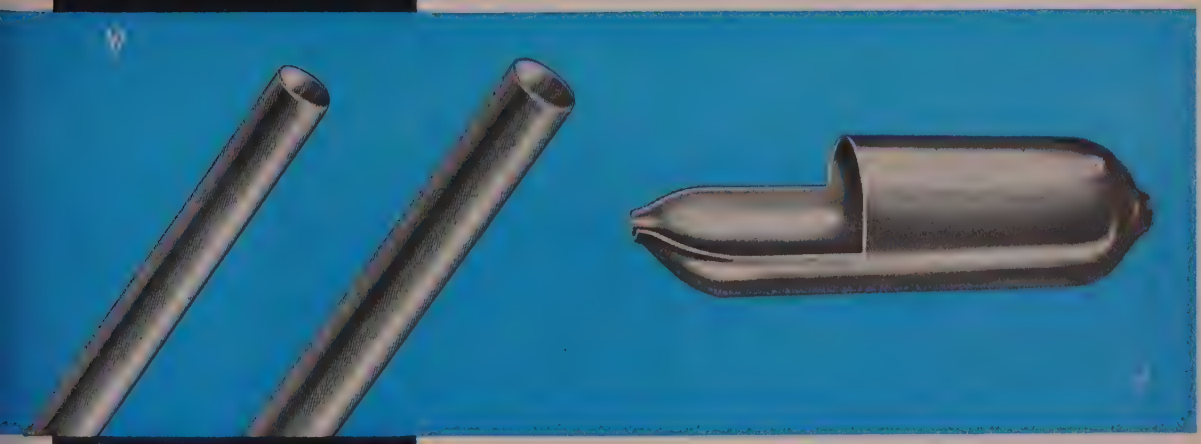
ALUMINUM IDEAS
BY
WOLVERINE TUBE

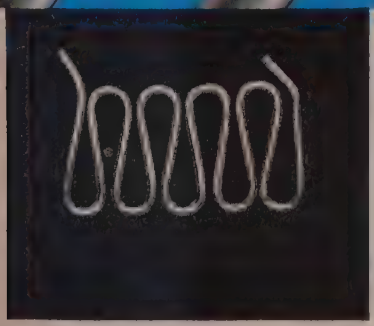
If your company is searching for a reliable aluminum tube source, why not try Wolverine Tube?

Here's a supplier with years of metalworking experience. Wolverine Tubes' product line is extensive and its adherence to quality control standards and customer specifications is second to none.

You can, for example, specify Wolverine in both drawn or extruded aluminum tube in prime surface form or with integral fins, in straight lengths, or in time saving long-length, bunch-type coils. If your requirements call for extruded aluminum shapes, Wolverine produces them to customer specifications. To insure its customers of complete aluminum service, Wolverine also maintains extensive spinning and fabrication facilities.

Wolverine's Aluminum Tube Catalog tells the complete story—is in addition, chuck-full of helpful information about this modern metal. Write for your free copy—TODAY.





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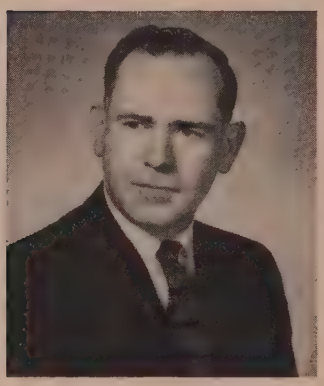
10 YEAR QUALITY RECORD OF ALODINE PRE-PAINT TREATMENT BACKED BY ALSCO MANAGEMENT-MANUFACTURING TEAM!

SPEAKING FOR MANAGEMENT

Ben Sugar, Alsco Vice-President Sales, on Alodine—"the foundation is the key to a successfully painted aluminum surface, and in the Alodine treatment, Alsco has found the best foundation in the industry. One of the major sales features we continually stress is Alsco's 'Six Bonds of Protection.' We consider Alodine one of the very important bonds that we use."



SPEAKING FOR MANUFACTURING

Dale Youssi, Alsco Plant Manager at Gnadenhutten, on Alodine—"Alsco has always used Alodine as a pre-paint treatment. We find the process extremely stable, the Amchem-designed electronic controls provide substantial labor savings for our quality control people, and Alodine has enabled us to speed up production rates while retaining uniform quality. The process is certainly paying for itself. For instance, improvements made in the process equipment during the last year have already been written off."

At Alsco's impressive manufacturing facility, Amchem Alodine has played and continues to play a vital role in maintaining the world-famous quality of Alsco products.

Using the new, improved Alodine 1200S pre-paint treatment for aluminum, Alsco is racking up traceable savings in time, labor and maintenance. The increased chemical activity of Alodine 1200S can reduce processing time as much as 50 per cent. In the last year, production line speeds have been increased by 15 per cent!

Alsco quality control personnel have acclaimed the installation of the fully automated (electronically) cleaner and coating stages on both their 3-strip and 2-strip lines. Alodine 1200S automation assures constant, uniform quality of the treated metal without constant operator attention to chemical bath maintenance.

Amchem technical assistance has been a major factor in sustaining Alsco's high quality within realistic cost structures. Continual improvements in the Alodine process have been instrumental in providing faster, better, more economical coating results!

There's an Amchem Representative in your area with a pertinent story on how you can build a foundation of better quality on your aluminum products . . . with Alodine 1200S. Call our nearest representative, or write to Ambler, Pa., for complete technical details.

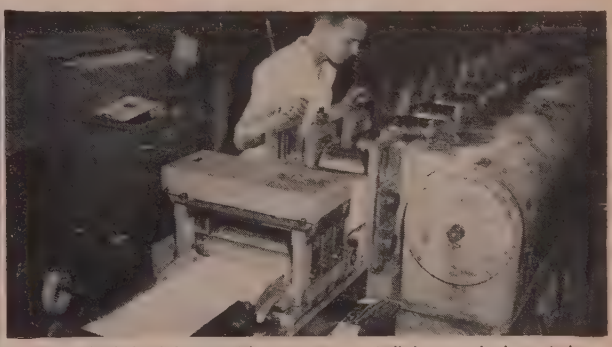
AT ALSCO

ALSCO QUALITY . . . FROM PRODUCTION TO PACKING

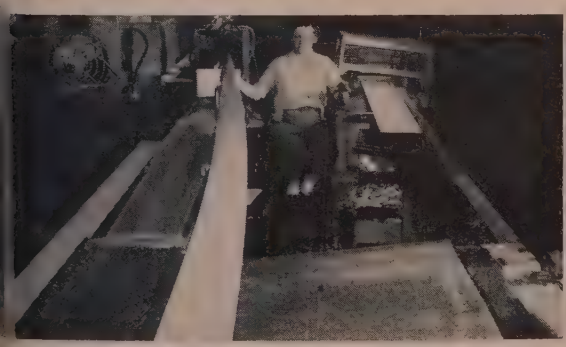
n the 3-strip metal preparation line, strip from aluminum coil is fed into Alodine processing baths where it is cleaned, rinsed, deoxidized, rinsed, coated with Alodine 1200S, rinsed, given a final acidulated rinse, then dried.

Emerging from the Alodine chemical bath treatment, aluminum strip is rewound prior to painting operation.

odized aluminum strip is roll-coat painted with Alsco's Gold Bak on one side nd pastel and deeptone colors on the exterior surface.



After paint is bonded to metal in temperature controlled ovens, aluminum stock is roller formed into final shape for siding.



er forming, worker turns siding over to receive Styrofoam insulation backing. sco was first siding manufacturer to Alodize both sides of strip)

Siding is inspected prior to packing and final shipment to Alsco dealers and distributors throughout the country.

NCHEm ALODINE 1200S

another chemical development of
AMCHEM PRODUCTS, INC., Ambler 24, Pa.
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Useful Data

"Aluminum Construction Manual," published by the Aluminum Association, is a 389-page volume containing much of the data needed by architects, engineers and designers who are concerned with stressed aluminum structures. A large portion of the book is given over to allowable load data on alloy 6061, the aluminum alloy most commonly used in structural applications. This information was computed by the Polytechnic Institute of Brooklyn. Following the introductory section—"Some Things the Designer Should Know"—the manual is divided into five parts. Part 1—data most frequently needed in designing aluminum structures after the forces to be resisted have been determined; Part 2—dimensioning, weights and other data useful in preparing estimates and drawings, plus load data on beam connections for alloy 6061-T6; Part 3—allowable loads for beams and columns in 6061-T6; Part 4—specifications for structures in 6061-T6 and 2014-T6, plus properties of aluminum structural alloys and design loads in buildings; Part 5—miscellaneous data useful to structural engineers and designers. The Aluminum Association hopes that the manual will not only be valuable to structural designers, but will also help building code authorities work toward greater acceptance of aluminum in their codes, and prove useful to teachers and students of structural engineering. Price of the book is $3.00. The Association's office is at 420 Lexington Ave., New York 17.

Bright welding wire is the subject of new promotional literature now available from Kaiser Aluminum & Chemical Sales, Inc. Kaiser's new King Brand wire is designed for high strength welding and is made in a complete line of rods and electrodes in a broad range of alloys. For copies, write to Dept. P-12, 1924 Broadway, Oakland 12, Calif.

Pittsburgh Lock rolling machines and auxiliary equipment are described in a new 28-page booklet recently published by The Lockformer Co., manufacturers of roll forming machines and accessories, band saws, portable slitters and other tools for sheet metal work. Each product is pictured, accompanied by data on capacity, operating speed, power package dimensions, etc. Ask Edward Bill for "Lockformer Everyday Miracle," at 4617 W. Roosevelt Rd., Chicago 50.

The CKL (Conical Keystone Lock) blind rivet is described in all its types and sizes in a well illustrated booklet covering nomenclature, outstanding features, strength characteristics and driving cycles. Complete specifications are given for each type. Address Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7.

A Specification Chart for aluminum users is a new reference compiled by Peter A. Frasse & Co., Inc. This handy working tool includes both federal and military specs for various aluminum alloys; also includes useful information on forming aluminum sheet and plate. The chart is printed on durable stock

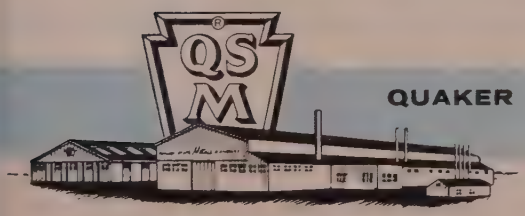
Service is our best Salesman

Technical Assistance is Airlifted from QSM

● If you have problems in manufacturing an aluminum product, QSM will fly to the rescue. Want to know which alloys to use for a new product? What's wrong with the metal you are now using? How to overcome a snag in your production line? What kind of new machinery will serve you best?

Let us know of your problems. We will come up with ideas, information, and the help you need. In emergencies, one of our technical experts can be airborne in a matter of hours.

Naturally, there's no charge for this help. It's a routine part of QSM's service to you—the service that's our best salesman.



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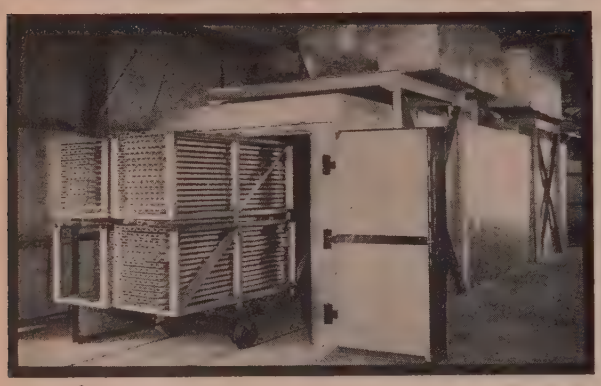

carl mayer Designs and Builds Better ALUMINUM Extrusion AGEING OVENS

This truck type oven is now in service at Penn Extrusion Corporation, Erie, Pa. Close temperature control is maintained through the use of two gas fired, recirculating air heating systems. Other Carl Mayer design features assure trouble-free, economical operation. Write for Bulletin HT-53.

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OTHER PRODUCTS: Core & Mold Ovens • Rod Bakers • Paint and Ceramic Drying Ovens • Special Processing Equipment & Accessories

tabbed for easy filing. Write to Peter Dolon at Grand St., New York 13.

"New Developments in Die Castings," a new booklet put out by The Dow Metal Products Co., describes the facilities of the new Dow division in the field of magnesium die casting. Photos and text show breadth of magnesium's use for die castings in many fields. Suggestions on magnesium casting design are offered, and are data on magnesium alloy AZ91B, most commonly used in commercial castings. Write to W. J. Richard at Midland, Mich.

Industrial ovens for use in the metalworking, electrical, food, chemical and other industries are thoroughly described and illustrated in a weighty catalog just put out by Despatch Oven Co. Included are basic data about laboratory ovens, pilot ovens and batch type production ovens. In each case, recommended uses, special features, specifications, and prices are given. The catalog is tabbed for easy reference use, and each section starts with an index briefly describing the equipment covered. Get your copy by writing to Clifford Hanson, Despatch Oven Co., 619 Southeast 8th St., Minneapolis 14, Minn.

"Slitting Lines for Coils and Sheets" is a newly revised 76-page booklet published by the Yoder Co., manufacturer of slitting equipment, roll forming machines, tube mills, and other metalworking equipment. The 2-part book not only contains basic information on design, selection and operation of slitters and slitting lines, but also includes detailed time studies and analyses of operating cycles plus specifications and other data on Yoder standard uncoilers, slitters, coilers, coil cars and scrap choppers. Copies may be obtained from Dick Burt, Advertising Manager, The Yoder Co., 5539 Walworth Ave., Cleveland 2.

Ultrasonic cleaners for the metalworking industry are explained and illustrated in Bulletin No. V8 put out by Gulton Industries, Inc. The fundamentals and advantages of ultrasonic cleaning are described, and subjects such as equipment selection, tank specifications, and cleaning agents are covered. For a copy write to J. G. Hamelin, Gulton Industries, Inc., Metuchen, N. J.

Abrasive finishing of aluminum and magnesium is the subject of a data sheet containing information on wheel heading, lubrication, buff speed, type of bu and the like needed for finishes such as satin, mat butler, and bright on castings, extrusions, stampings, spinnings, etc. A copy may be obtained from L. Bakinow, Advertising Manager, The Lea Mfg. Co., 16 Cherry St., Waterbury 20, Conn.

"Mouldings and Trims in Aluminum and Stainless Steel" is a detailed catalog that illustrates and gives specifications of over 120 extruded and roll formed shapes for everything from sink edging, stair nosing, and price tag moulding to thresholds, cabinet covers and wall cap strips. Get your copy from Albert Mitchell, Metal Trims, Inc., P. O. Box 632, Jackson 5, Miss.

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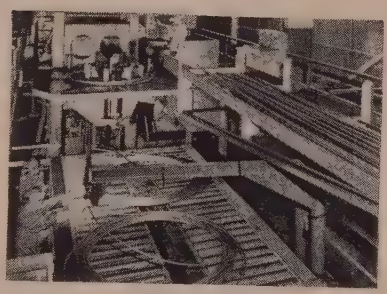

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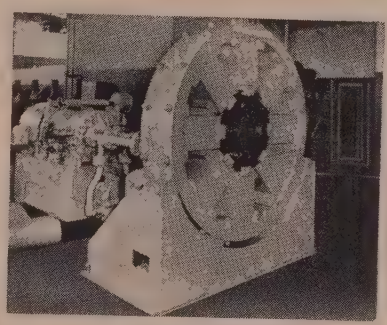

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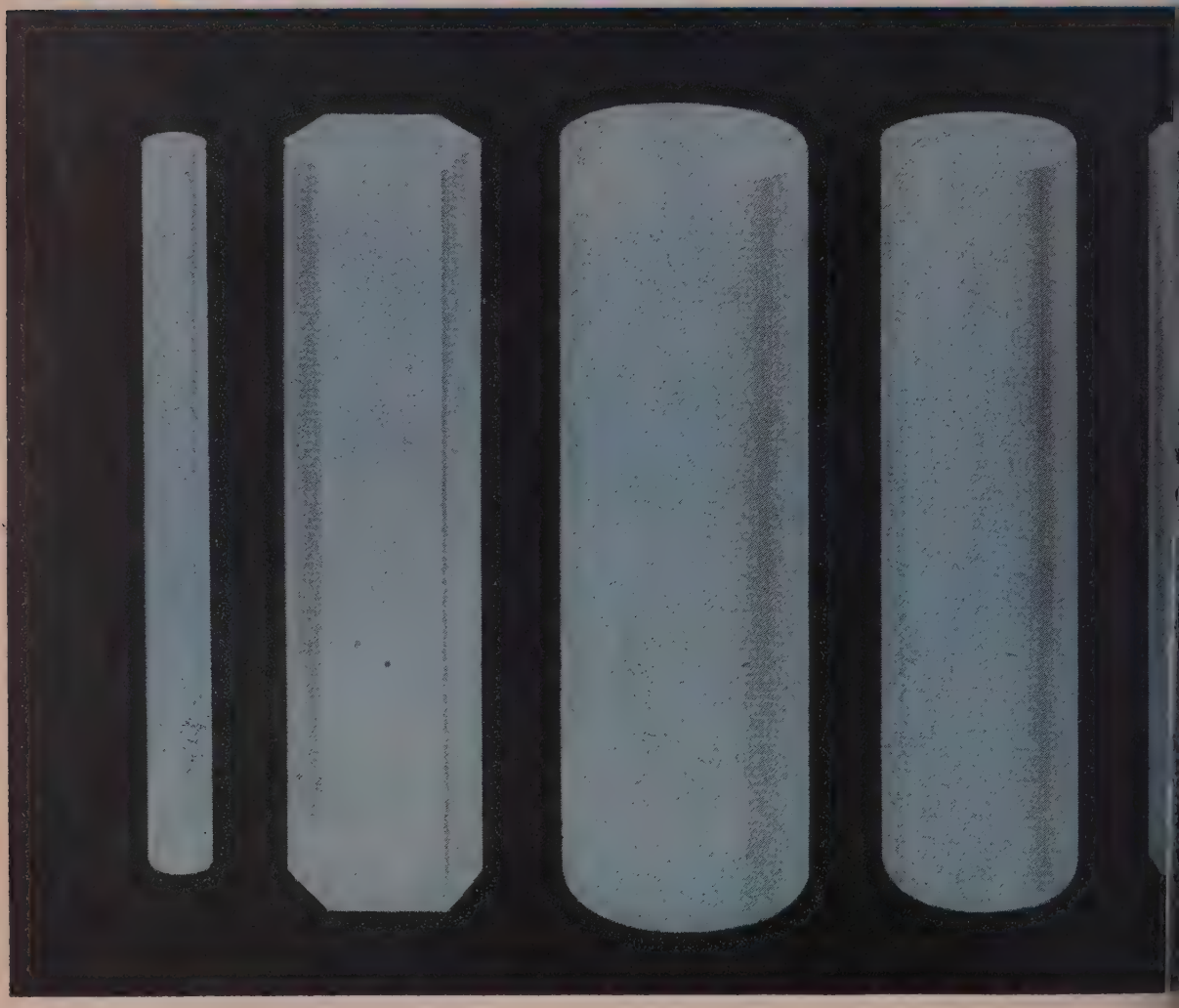

Bridgeport–a new prin

HOW NEAR IS YOUR PHONE? Bridgeport's new and expanded warehouse service on aluminum, brass and copper is just that close!

Of course, the added convenience of fastest delivery is only *one* of the advantages Bridgeport offers. You can also count on "all-the-way-through" quality that's the result of exacting care in alloying, tempering, finishing and testing. Careful adherence to tolerances, too. In fact, when you dial your Bridgeport warehouse, you're dialing *a tradition*—of service, of quality!

What's more, these same warehouse facilities are the perfect service source for special aluminum shapes, extrusions. Copper and brass alloys, too. Start *today* to get prime products, prime service—from Bridgeport!

Bridgeport Aluminum Screw Machine Rod

Alloys:	2011-T3 2017-T4 2024-T4 6061-T6
Diameters:	½" to 2" Rounds or Hexagonals
Lengths:	12-foot standards

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Alloys:	1100 3003 3004 5005 5050 5052 5357
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LOS ANGELES: RAymond 3-5101, PArkview 1-5171
MINNEAPOLIS: FEderal 9-7061
NEWARK (Hillside): Bigelow 3-0044
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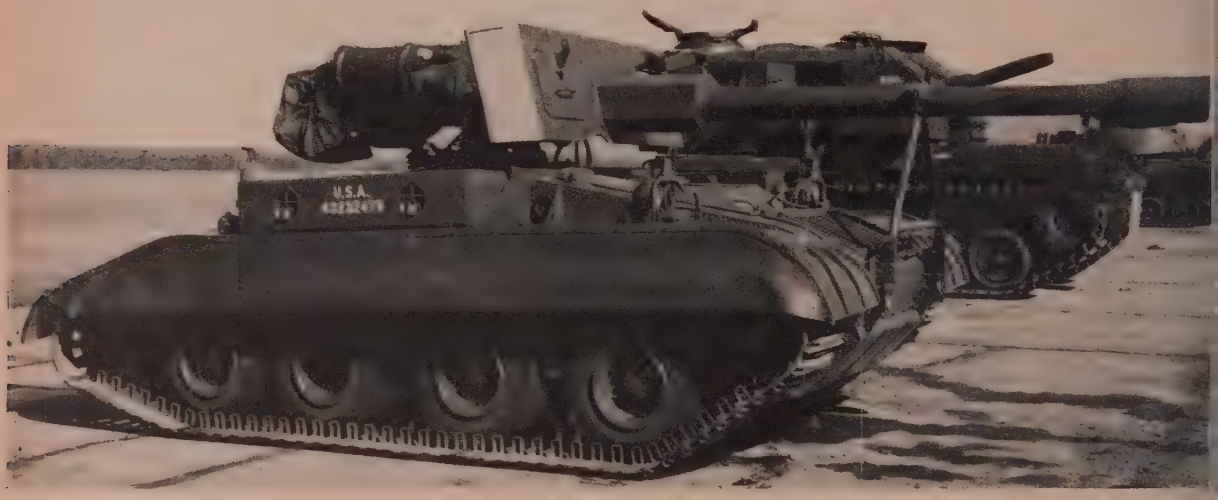
To the Army Ordnance Corps . . .

MORE ALUMINUM MEANS MORE MOBILITY

by
Hollis McLaughlin
Defense Industry Sales Manager
Kaiser Aluminum & Chemical Sales, Inc.

To keep pace with modern warfare techniques, military equipment mus be highly mobile, air transportable, often capable of being parachute to the scene of action. This rules out much of the Army's present rollin stock. The sweeping redesign program now underway opens enormou opportunities for light metals; promises to make military gear—mainl tanks and vehicles — one of aluminum's two or three biggest markets



AT APPROXIMATELY 2 o'clock on the afternoon of May 13, 1958, the Continental Army Command ordered the 101st Airborne Division to rush a task force to Puerto Rico. Within two and one-half hours, a C-130 Hercules cargo plane loaded with combat ready paratroopers was taking off at Fort Campbell, Ky. At 10:25 that night, this lead plane of the task force landed at Ramey Air Force Base in Puerto Rico.

By dawn the following morning, 560 more 101st Division paratroopers had landed at Ramey, along with all their weapons and ammunition, four days' rations, 59 vehicles, a helicopter, and all of the other equipment needed to stage an airborne assault.

Everything had been airlifted a distance of 1600 miles—overnight—by the 314th Troop Carrier Wing, operating out of Sewart Air Force Base in Tennessee.

This swift exercise in mobile striking power demonstrated the U. S. Army's new—and still evolving—approach to its traditional mission. The Army is still built around the most versatile fighting machine ever devised—the American soldier—but it must gear its tactics and logistics to the realities of the thermonuclear age.

It can no longer take the time to prepare the soldier for a specific mode of fighting within a specific area as in World Wars I and II. It must be able, on very short notice, to speed the fighting man and his equipment to virtually any spot on the globe. And once there, he must cover more ground, disperse and regroup more quickly, and perform more duties than any soldier in history.

With mobility the key to effective striking power, the Army must both lighten and simplify its logistical burden. The lighter the equipment, the easier it is to transport. And the fewer the number of items to be moved, the easier and cheaper it is to move them.

ALUMINUM IN ARMY ORDNANCE VEHICLES NOW BEING TESTED OR IN PRODUCTION

VEHICLE	POUNDS PER UNIT
M-113 (multi-purpose vehicle)	12,000
T-114 (multi-purpose vehicle)	6,500
T-116 (personnel carrier)	2,500
M-274 (mechanical mule)	136
Mighty Mite (utility)	374
M-56 (gun motor carriage)	1,500
M-60 (medium tank)	5,000
T-195 (self-propelled artillery)	14,000
T-257 (mortar carrier)	7,500
XM-410 (truck)	2,200
XM-408 (truck)	1,200
LARC-5 (amphibious, cargo)	over 10,000

Aluminum, by virtue of its ligh weight, ample supply, and improved a loys and processing methods, has secure a firm foothold in the Army procure ment picture. And as the move towar airborne mobility gains momentun military hardware will once more b come one of aluminum's largest market

Indeed, this is one of aluminum biggest markets today, despite the stee decline in the use of aluminum in mil tary aircraft. Consumption of the met in defense uses dropped from 369,50 tons in the Korean War year of 195 to an estimated 240,000 tons last year.

But the dwindling aircraft busine alone accounted for 74% of this declin Other defense uses have been gainin —from about 127,000 tons in 1955 to a estimated 140,000 last year. Ordnanc equipment has accounted for much o this gain.

Big Market in Vehicles

Vehicles consumed 85 million pound of aluminum sheet, plate, extrusions an forgings in 1958. Missiles consumed 1 million pounds, and the forecast fo '59 is 24 million. Missile support equi ment consumed 18 million pounds; th forecast for '59 is 36 million. Othe ordnance uses are forecast at 100 millio pounds in '59.

The estimated 234,000 tons of al

inum that went into military applica-ons in 1958 represented 13% of all ie metal shipped that year. It was :cond only to the building industry mong aluminum customers and was ed only by the electrical industry for)tal consumption.

These tonnages are the result of normal" Army procurement; they re-ect only slightly the effects of the ew mobility concept for weapons and ehicles, which as late as the summer of 9 was mostly in the prototype or re-arch and development stage.

New military vehicles are not created vernight; it may take 36 to 42 months) complete the cycle from concept to roduction contract. Applied to the iew mobility" concept, this puts actual roduction of some Army vehicles al-:ady being tested somewhere along in)60 and '61.

How fast, and on how large a scale, ie conversion to lightweight vehicles id weapons will take place is still con-:ctural because of budget uncertainties, it some major overhaul of the Army's ;uipment seems bound to occur within 'e next few years.

MINIMUM MECHANICAL PROPERTIES OF THE 5000 SERIES ALUMINUM ALLOYS

(Aluminum Alloy 6061 & Mild Steel included for comparative purposes)

Alloy	Temper	Ultimate Tensile Strength psi Min.	Yield Strength (1) psi Min.	Elongation in 2 Inches % Min.
5052	0	25,000	9,500	18
	H112	28,000	—	7
5154	0	30,000	11,000	18
	H112	30,000	11,000	8
5454	0	31,000	12,000	18
	H112	32,000	18,000	8
5086	0	35,000	14,000	14
	H112	36,000	18,000	8
5083	0	40,000	18,000	16
	H113	44,000	31,000	12
6061	0	22,000 (2)	12,000 (2)	18
	T4	30,000	16,000	18
	T6	42,000	35,000	10
Mild Steel		60,000	31,000 (3)	25

(1) Stress to produce 0.2% permanent set
(2) Maximum—so specified to insure complete annealing
(3) Commonly referred to in steel as elastic limit

Where It Can Be Used

Aluminum's unique qualities fit it r use in a broad cross-section of dnance equipment, including:

1. Weapons and guided missiles, to-ther with ground support equipment.
2. Combat vehicles, including tanks, :apon carriers, and self-propelled ar-lery.
3. Armored and unarmored vehicles r transporting men and materials on nd or across inland waterways.
4. Specialized engineering and construction vehicles for direct field support of combat units.
5. Specialized support equipment, such as portable bridges, landing mats, cranes, shelters, shipping containers, pallets and materials handling equipment.
6. Optical, aerial, mechanical, electrical and electronic systems for locating and tracking targets.

The army also uses many "civilian" products that are available in aluminum, or are candidates for conversion to aluminum in order to make them more air-transportable. Among these are tent hardware, mess kits, cans, automobiles, commercial trucks, lockers, buildings, canteens, furniture, office equipment, fencing and siding.

Of these applications, the greatest new tonnage potential for aluminum lies in vehicles, missile support and materials handling equipment.

Speeding aluminum's penetration are impressive developments in alloys and techniques that make the metal particularly attractive for military applications.

A major recent advance has been the development of new, weldable, high strength aluminum alloys by Kaiser Aluminum. Originally developed by Kaiser Aluminum's Department of Metallurgical Research, alloys 5083 and 5086 provide maximum utility, joint strength and efficiency in welded structures, particularly those subject—as Army vehicles are—to impact or dynamic loading.

These new alloys are now available in sheet, plate, forgings and extrusions, and have shown substantial design advantages over comparable welded high strength alloys in general usage. They also have good forming properties, outstanding welding characteristics, excellent resistance to corrosion, and improved weld zone ductility.

Alloys 5083 and 5086 have found application in missile skins and structures, amphibious and armored vehicles, crew boats, bridges, flatbed trailers, naval cranes and destroyer gun mounts.

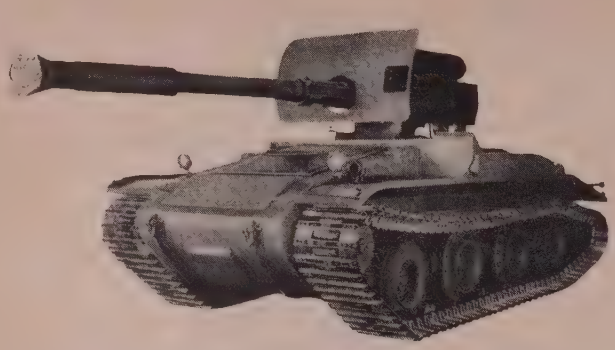
Another characteristic of aluminum that is of vital importance to the military is the fact that its structural qualities are actually improved at the ultra-low temperatures encountered in the manufacture and handling of liquid gases used in liquid fuel missiles. Because it is the lowest-cost metal capable of performing satisfactorily at below —150°F, aluminum alloy sheet, plate, extrusions, tubing and pipe have found widespread use in military and commercial low-temperature applications.

Extensive use of aluminum in body d engine makes Mighty Mite easily insportable by helicopter. Produced the U.S. Marine Corps by American tors, this ¼-ton, 4 x 4 lightweight ck can haul weapons or communica-ns gear; evacuate wounded, etc.; climb ep grades; negotiate rough terrain.

Weldable Alloys Approved

Aluminum in liquid fuel systems has the added advantages of light weight and greater safety under field handling conditions because it is non-sparking, non-magnetic and non-toxic.

Several weldable aluminum alloys have been approved by the American Society of Mechanical Engineers for construction of unfired pressure vessels, such as are used in the handling of liquid gases. Kaiser Aluminum alloys 5083 and 5086 are the strongest ASME-approved aluminum-magnesium-manganese alloys that can be fabricated into these welded vessels by all normal meth-



■ *U. S. Army's increasing acceptance of aluminum is demonstrated in the M-56 self-propelled gun (left) and the new XM-410 truck. Featuring a riveted aluminum hull, the M-56 can carry its 90-mm rifle over muddy, marshy or sandy terrain; will do up to 30 mph; can be air transported and parachuted to scene of action. The XM-410 is the first of a new family of trucks developed by Chrysler Corp. for Army Ordnance. Its aluminum wheels, hubs, frame, body, and transmission, axle and motor housings help give it 30% more carrying capacity and 50% better fuel mileage than the 2½-ton truck it is expected to replace. Use of aluminum in the XM-410 totals 2200 pounds per unit.*

ods without stress-relieving or annealing.

Greatly extending the versatility of the new weldable alloys have been advances in welding techniques which extend the range of application and reduce the cost of welding aluminum. Inert gas metal arc (MIG) welding is the primary method for welding aluminum in the ordnance, shipbuilding, cryogenic and process industries today.

Similar advances in casting alloys, including alloys A356 and 357 developed by Kaiser Aluminum, have increased strength and improved ductility and corrosion resistance in cast applications. These, too, open new fields for military usage.

Aluminum Armor

Perhaps surprising to civilians is armor plate. Its development rests partly on the introduction of high-strength weldable aluminum alloys, like Kaiser Aluminum's 5083, combined with new processing and finishing techniques, and partly on the new role armor must play in modern combat vehicles.

Aluminum armor plate was first introduced by Kaiser Aluminum and other major producers in 1956 and samples were furnished Frankfort Arsenal for ballistic testing. In January 1959, the aluminum industry, fabricators and the Army used the experience gained from these tests to establish the weldable aluminum armor plate specification, MIL-A-46027A (Ord.).

In addition to its extensive aluminum armor research program, Kaiser Aluminum, late in 1958, established a firing range for ballistic testing—the first such facility in the aluminum industry. The company is also testing forged and extruded forms for ballistic properties.

The increased availability of aluminum in all its forms gives the military complete assurance that even in the most trying times there would be an adequate supply of the metal for use in armor applications.

Aluminum armor is also non-magnetic, thus affording protection against at least one type of mine. Aluminum also provides good protection against the immediate lethal effects of atomic radiation.

The air-transportable requirement for field equipment dictates the maximum weight of any single item, as well as its length and width. For "Phase I" transportability (items that can be carried by current aircraft) the weight limitation is approximately 16,000 pounds per unit.

This does not mean that vehicles have to be held to that weigh limit; but that any individual component must be This has led to the concept of basi components that can be assembled i the field.

A battle tank might be composed o three separate components — hull an chassis, fire turret and gun, and pro pulsion unit—each part of which woul meet the air weight requirement, ye the assembled vehicle could weigh u to 48,000 pounds.

■ *Tank treads forged in aluminum by Kaiser Aluminum's Erie (Pa.) forging plant have been tested by the Army. Use of aluminum treads could save up to 1000 pounds per vehicle compared to steel treads. Success of test program could lead to adoption of aluminum treads in tanks and other vehicles.*

Standard Parts; Fewer Parts

Obviously, this concept can be carrie over to the second requirement of mo bility, which envisages standardizatio so that fewer parts are required to main tain an Army on the battle line.

Thus, the component portability re quirement and the desire for standard ization creates the "family concept" for military vehicles. Under this concep the development of new vehicles be comes an evolutionary process whic begins with the development, provin and acceptance of "building blocks" which can be combined to produce ne vehicles.

The hull and chassis of a tracke vehicle might perform a variety of task through the use of interchangeable su perstructures. It might serve as a battl tank, self-propelled artillery, missil launcher, personnel carrier, or comman and communications post simply b changing the mount.

While the airborne requiremen opens an obvious opportunity for alu minum, the significance of the stand ardization program is not so obviou But the program may call for the ever tual redesign of virtually the entir Army vehicle establishment, thus open ing the way for possible aluminum ap plications.

This opening scarcely existed as lon as Army modernization was based o

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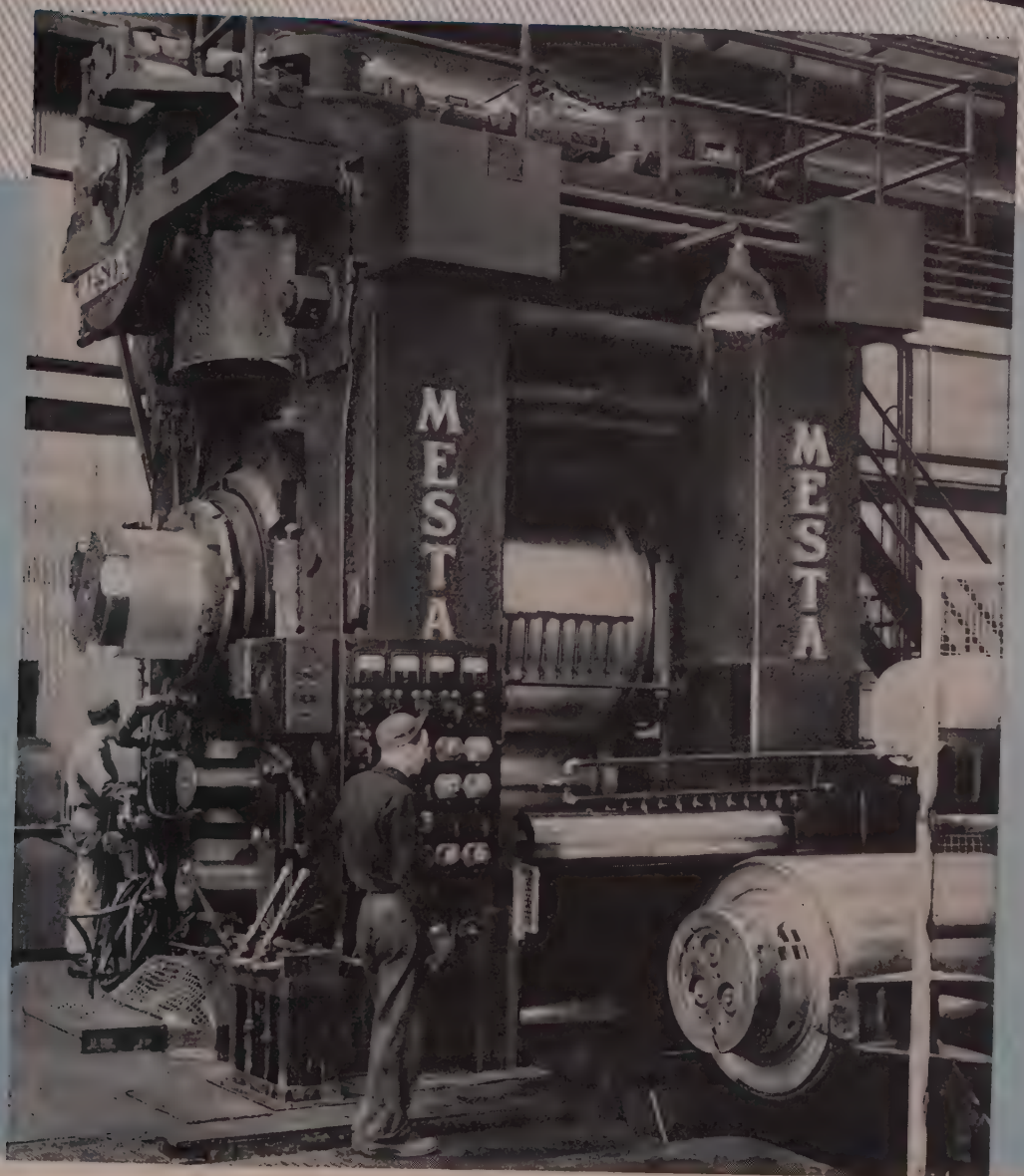

Designers and Builders of Complete Steel Plants

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PITTSBURGH, PENNSYLVANIA

■ *Exemplifying the new look in Army Ordnance vehicles is the M-247 Mechanical Mule built by Willys Motors. Powered by a 125-pound aluminum engine, it weighs only 900 pounds but can carry 1000 pounds of cargo, plus the driver. This remarkable little workhorse not only hauls cargo and personnel, but can also serve as mobile platform for a 106-mm rifle. It can ford streams and clamber up 50% grades.*

slight modifications of traditional equipment. Since spare parts must be transported, the light weight of aluminum should appeal to designers and logistics experts, alike.

Every pound saved through use of aluminum in a vehicle can be translated into greater range, more economical use of fuel, higher payload, less tire wear, and lighter suspension systems. These savings represent the "real cost" of the converted vehicle, which is what the Army must reckon with in its budgeting and procurement.

A combination of all these factors—the desire for mobility, air-transportability, and standardization, plus advances in aluminum availability and technology—have proved the foundation for a whole new race of military vehicles now in research and development, prototype or production.

Pint-Sized Trucks

Based on the Army's successful experience with Willys Motors' World War II Jeep, there has been developed a family of small vehicles for close combat support. These include Willys' Mechanical Mule, American Motors' Mighty Mite, and Ford Motor's MUTT. All three vehicles are small, light weight, air transportable, able to operate in nearly any kind of terrain, and have extremely high payload for their curb weight.

A further extension of their versatility is an amphibious phase, which enables them to carry troops, weapons and material across rivers and inland bodies of water without requiring bridges or ferries.

Closely related to these vehicles, at least from the standpoint of transporting the foot soldier and increasing his maneuverability, are a new series of one-man air vehicles now in the research and development stage. There are two types, and both utilize aluminum extensively.

One is a helicopter reduced to its barest essentials to achieve compact design and light weight. Some versions are so small that they can be carried by one man and assembled in the field.

The other type is based on the "ducted fan" which is simply a "fan in an upside down bucket." The air blown downward by the fan creates a cushion that lifts the vehicle. A number of companies are testing prototypes of these "flying platforms."

The realm of the new Army vehicle "family" concept began with the advent of the M-113 series of vehicles, that can be airborne, armored, and used am biously. The M-113 has full track all-terrain work, is lightweight, features low construction cost and ot maintenance, operation and servic

To this basic vehicle can be ad various configurations for a wide var of tasks, including a personnel car a mortar mount (the T-257), a c tractor (the T-122), the Vigilante anti-aircraft weapons system, and launcher chassis for ballistic missiles. anti-tank service, it can mount the I Missile A, and the "SS" missile.

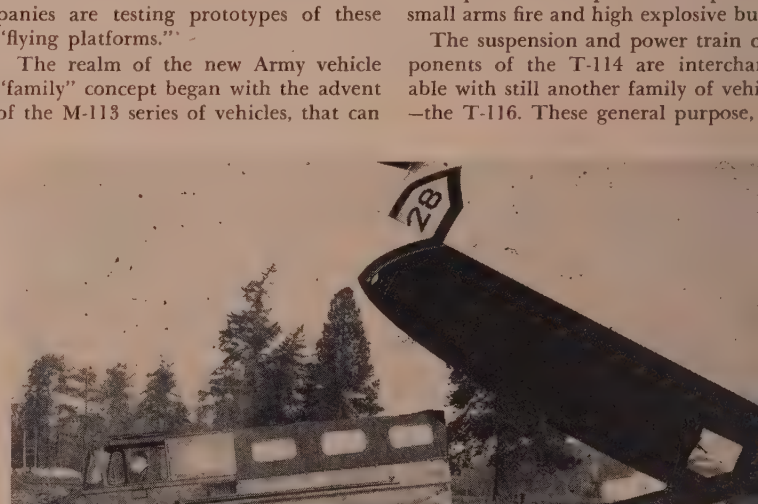
Contracts for the first pre-produc prototype M-113 vehicles were awar early this year to the Food Machi and Chemical Corp.'s Ordnance I sion at San Jose, Calif. Food Machi just received a contract for 900 M vehicles, to be delivered in 1960.

Armor for the M-113 consists of t plate sections of Kaiser alloy 5083. F resentatives of Kaiser Aluminum wor closely with Food Machinery engin in testing and demonstrating the p erties of 5083 for the M-113.

They're Interchangeable

The M-113 concept is exten through two further families of sim vehicles. The T-114 is a highly mo amphibious, armored, command re naissance vehicle developed by Cad Tank, Cleveland. It could also be u to house electronic equipment for sile operations in positions exposed small arms fire and high explosive bu

The suspension and power train c ponents of the T-114 are interchan able with still another family of vehi —the T-116. These general purpose,



■ *Typifying the "family" concept in vehicles is the T-116, a general purpose, armored, tracked amphibian that will carry cargo, personnel or missiles. Desig to be air-lifted to work site, it has a welded hull of 5086 alloy sheet supplied Kaiser Aluminum. Kaiser also forges the tank treads in alloy 5083. Total we of aluminum is 2500 pounds per unit. The suspension and power train compon are interchangeable with T-114 armored vehicle. T-116 is built by Pacific Ca Foundry Co. In this view it is being unloaded from cargo plane.*

Radiographs-

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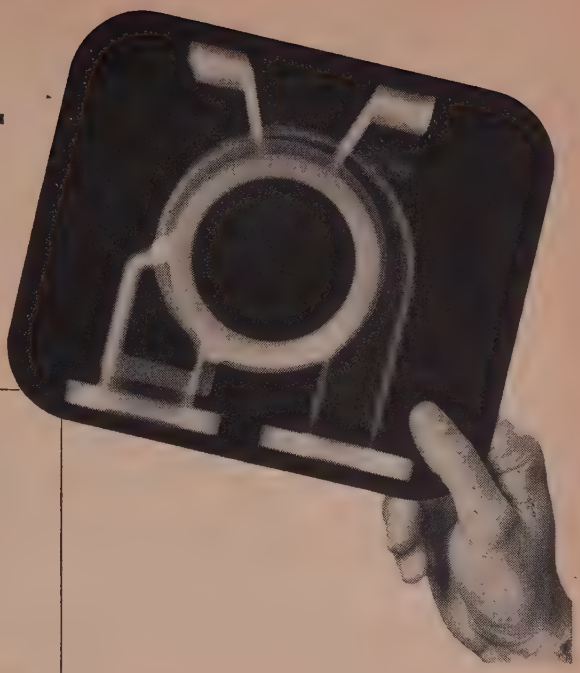

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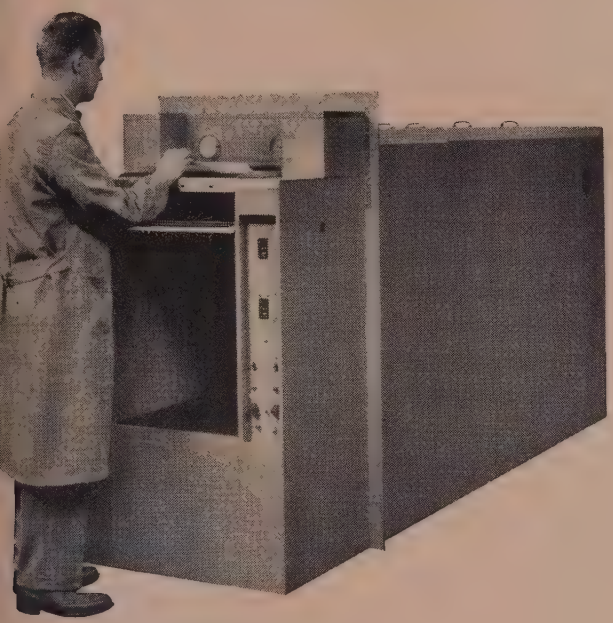

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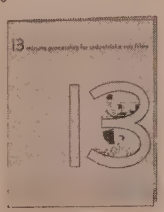

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■ *New concept of multi-purpose vehicles is depicted in this drawing showing the ABC (All-Purpose Ballastable Crawler) in action. Adaptable to such jobs as bulldozing, road scraping, troop and cargo transport, it is designed to be transported by air. Empty ballast chamber is then filled with dirt to give vehicle necessary weight to perform heavy jobs. It is made largely of aluminum. International Harvester Co. began development work on the ABC in 1958.*

armored, full-tracked amphibious vehicles can be lifted by helicopter and feature a large open cargo area which is easily adapted to transporting missiles or personnel.

The T116 will accommodate 10 to 12 persons including the driver. Wide tracks and the low position of the power pack give it a low center of gravity for high maneuverability on rough terrain.

To conserve the air transport capability, the T-114 uses 6500 pounds of aluminum and the T-116 uses 3750 pounds.

In Tanks, Too

The high-mobility requirement is being extended to the Army's new tanks. This spring, Army Ordnance placed an order for 180 M-60 tanks with Chrysler Corp. at Detroit. The M-60 serves not only as a combat vehicle, but can be used as a missile carrier or a tractor for missile-carrying trailers. Each tank uses more than 6000 pounds of aluminum.

The M-60 incorporates a number of aluminum components including forged wheels and hubs, plate fenders, tubed ammunition containers, sheet aluminum air cleaner, racks and fittings, engine parts, and transmission housing. Two 200-gallon fuel tanks for each vehicle are constructed of 5083 sheet and use 500 pounds of aluminum each.

The Army's new T-92 light tank is designed to utilize 7000 pounds of aluminum per unit, and the T-96 medium tank is using 1000 pounds.

An extension of the "family of vehicles" idea in the tank field is the T-195-1 and T-196 all-aluminum self-propelled artillery series. This program is aimed toward giving the military a choice of medium and heavy tank turrets with multiple selections of fire control systems.

The armored chassis mounts a 105 mm. howitzer, is self-propelled, amphibious, and armored with aluminum. When used as a missile mount, its 100-inch turret ring gives its weapon 360° traverse. Aluminum usage is estimated at 14,000 pounds per unit.

Treads Save 1000 Pounds

Forged aluminum tank treads for a medium tank as well as the T-116 are produced at the Kaiser Aluminum Erie forging works, and have been tested at Aberdeen. They save about 1000 pounds per vehicle over steel treads; may lead to wider adoption of forged aluminum treads for other types of military and civilian tracked vehicles.

Another self-propelled heavy artillery vehicle with high potential for alu num is designated T-236. It consists a lightweight gun carriage that mount the 8-inch howitzer (T-236); 15 mm. gun (T-245); or the 175 m gun (T-235).

Formidable Family

To support troops and weapons the field, the Army has embarked or program to create a new family of droppable and water floatable lig weight trucks. They, too, have ma bodies adaptable to a single chas Spare parts reduction is accomplish through the use of an identical engi transmission, transfer case, wheels a tires, suspension and cab.

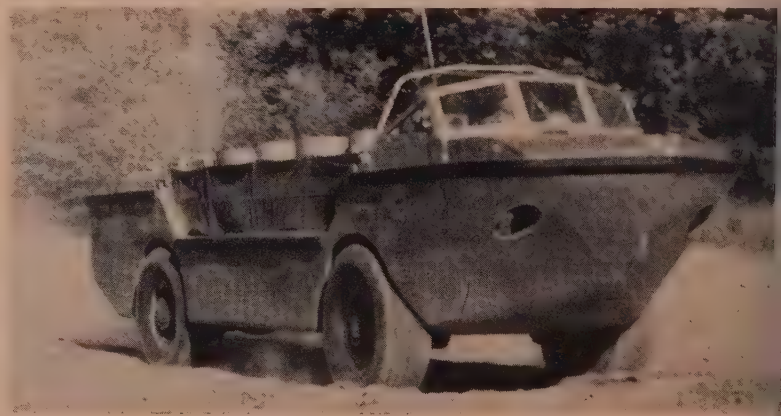
The basic prototype of this new fa ily has been built by Chrysler Corpo tion. It has a 2½-ton capacity, weighs only 8600 pounds, about half weight of the Army's present standa 2½-ton truck. The prototype conta about 2000 pounds of aluminum.

The first model is an 8 x 8. Oth in the series, the 4 x 4 (1 ton) a 6 x 6 (1½ ton), are being develop by Chrysler. The prototype is an terrain vehicle, can be parachuted fr the air, and can be propelled acr water under its own power or by outboard motor.

New military trucks in the 3½-to ton series, being developed by Fo Motor, General Motors Truck a Coach, and Reo, make extensive use aluminum.

Application of aluminum in the n intermediate and medium truck vehic may well lead to an extension to many types of flatbeds, trailers and m tor-drawn carts required for logistic su port. Normal Army truck requireme are estimated at about 10,000 units all types each year.

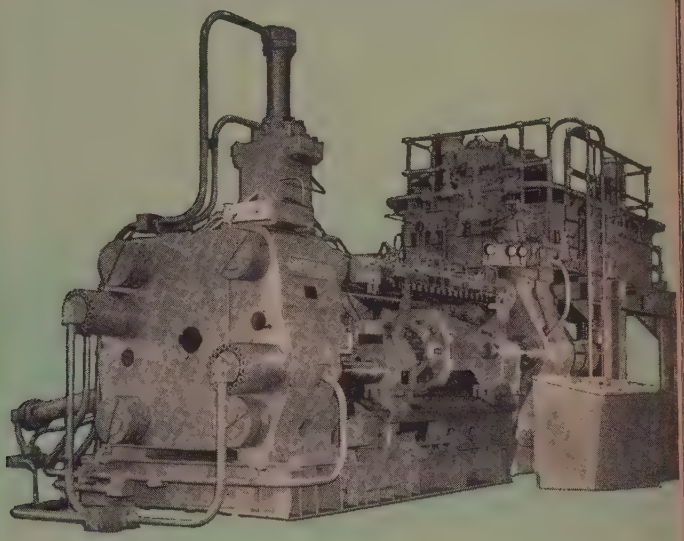
Specialized amphibious vehicles n in the developmental stage include



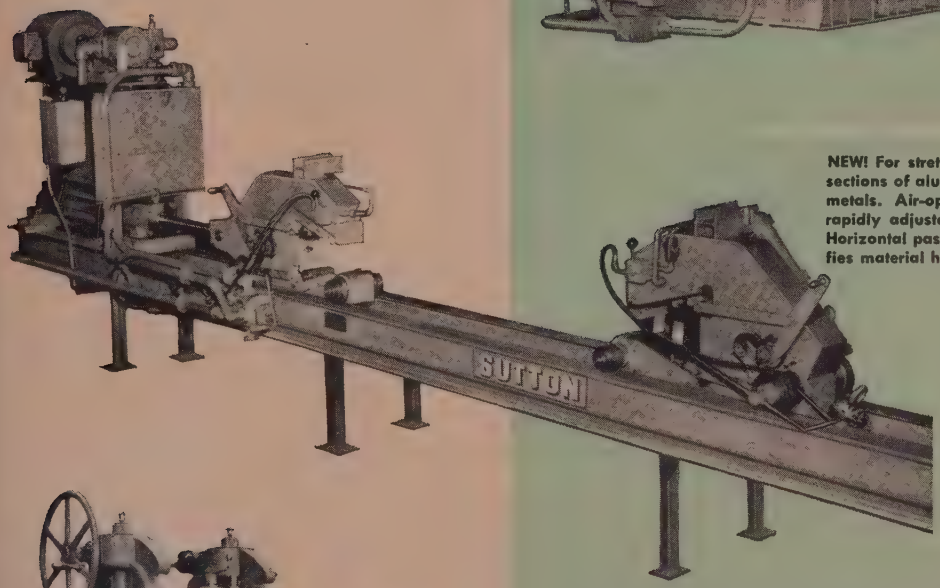
■ *The Army's 5-ton LARC-5, built for ship-to-shore unloading operations, moves 30-35 mph on land, 10 mph on water. Its all-aluminum construction boosts payl well over that of previous amphibious vehicles. Borg-Warner Corp.'s Inger Kalamazoo Division builds it.*

SUTTON

for profitable production!



NEW! For high-speed production of aluminum shapes. Featured is a special electric-hydraulic system for entirely automatic cycling with solid, porthole or bridge-type dies.



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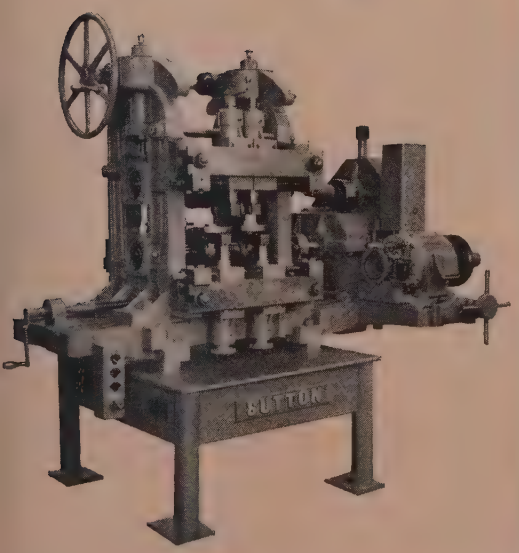

NEW! Corrects cross-sectional distortions of aluminum extrusions to extremely close tolerances. Multiple corrections can be made in one pass. Easy change-over for different shapes.

Producers and extruders of modern metals are urged to investigate Sutton processing machines as well as presses. For maximum profit, high-speed production must extend beyond extruding or rolling into the various finishing and processing functions.

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Engineering Company

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Superduck, Drake, Go-er and LARC. The Superduck is a 4-ton capacity amphibious truck capable of transporting light artillery, light missiles, ammunition, combat personnel, cargo, and light vehicles in amphibious assault operations.

The Drake is capable of both logistic and tactical support and is an 8 x 8 with 10-ton capacity. The Go-er extends the "family" concept to a very large (15-ton capacity) amphibious, all-terrain vehicle with large wheels and high-ground clearance. The LARC-5 (Lighter, Amphibious, Resupply, Cargo) is a 5-ton aluminum cargo carrier designed to replace the World War II DUKW. A 15-ton version, the LARC-15, will soon be delivered.

The completing link in the concept of all-terrain, amphibious operations is provided by assault ferries now being built and tested by Chrysler. A group of these ferry-type vehicles can be joined together so that their interlocking decks provide a large platform bridge for heavy tanks and other vehicles which are not themselves amphibious.

The "family" concept also is being explored by the Army Corps of Engineers. In any future warfare, highways and bridges will be cut and destroyed to reduce the mobility of combat groups. This will mean that new bridges, roads, and air fields will have to be built quickly if tactical momentum is to be maintained.

■ ***Superduck is one of a new group of amphibians now under development. This 4-ton capacity vehicle can transport not only troops and other vehicles, but also light artillery, missiles, ammunition, supplies. Other new amphibians include the Drake, the Go-er, and LARC.***

Adjustable-Weight Vehicles

During 1958, development of an All-Purpose Ballastable Crawler (ABC) was begun under contract to the International Harvester Co. The concept was for a multi-purpose air-borne vehicle that could be adapted to such functions as bulldozing, road scraping, dirt hauling or carrying troops and supplies as the tactical situation demanded.

To make the vehicle both light enough for air-transport and heavy enough to perform road-building functions the ABC has a ballast chamber that is empty while the vehicle is being transported. When it arrives at the scene of action, it fills its ballast chamber full of dirt and this gives it the deadweight required for the job.

When it is to be moved again, it simply ejects the ballast and is ready for flight again. Specially designed pod-type loads can be carried in the ballast compartment for logistical support. Other special detachable body configurations may be devised to enable the ABC to function as a machine shop, electric power generating unit, pump station or air compressor.

The vehicle achieves its air transportability and all-terrain capability through its design and the use of aluminum structurals.

It is estimated that its use, in conjunction with its wheeled counterpart the Ballastable All-Purpose Tractor (BAT, produced by Barnes-Reinick, Chicago), could replace 119 makes and models of standard equipment, and cut the number of spare parts required for field operations from 161,160 to 4,08

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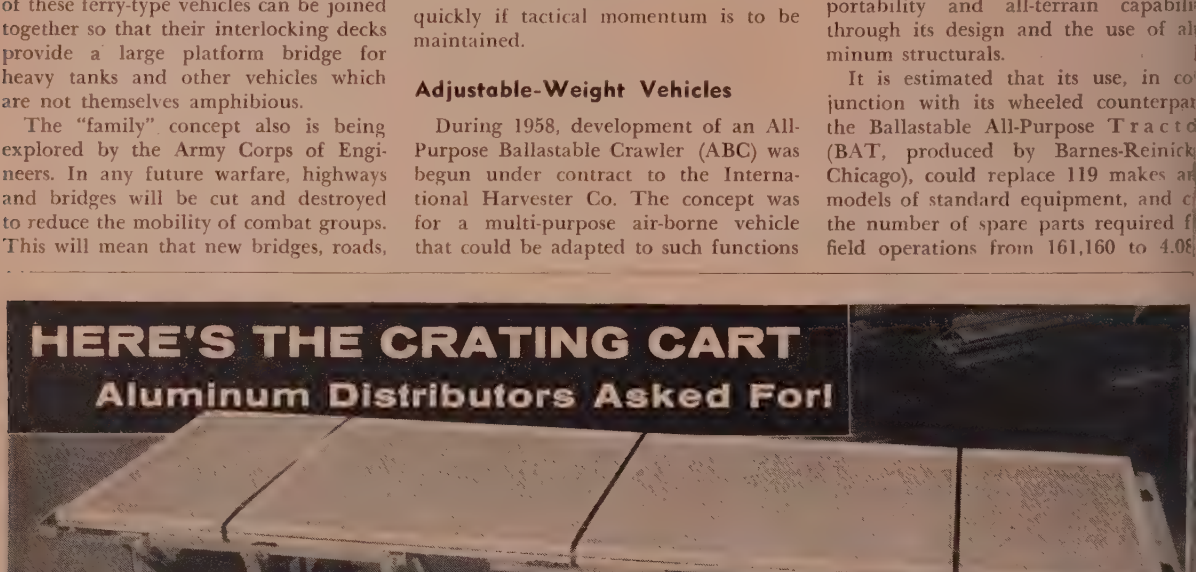

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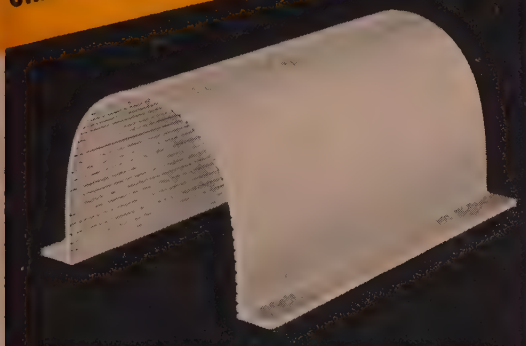
ASSIGNMENT:

EXTRUDE A 7" WIDE x .050" THICK CHANNEL SHAPE ON A 5" CAPACITY PRESS



The part as it comes from the extrusion press. A simple straightening operation, a little additional fabricating to come.

other extruders said it couldn't be done...

GENERAL DID IT!

The manufacturer of heaters brought his problem to General Extrusions, Inc. He wanted a hearth bottom for his product — a fluted, gold-anodized aluminum extrusion. The specifications called for a 7" x .050" shape. Extruders with presses that take 8" diameter billets said it couldn't be done because of the thinness, too great a reduction ratio.

G.E.I. engineers came up with the extrusion he wanted, on a 5" press! Here's how: The shape is extruded half round, then straightened, notched and bent, holes punched. The final operation is anodizing the shape in General's Brite Generaleaf Gold Finish.

G.E.I. extrudes this shape AT REGULAR SOLID SHAPE PRICE. The costs are less than would be incurred on a bigger press. The die costs, alone, were less than half.

If you have a problem involving aluminum fabrication, finishing or extrusion, why not take it to General's ingenious staff of engineers. It costs nothing to consult with them, on one part or a million. These highly skilled technicians are pioneers in the field of designing and developing new uses for extruded aluminum. Imaginative, they often come up with results other extruders say can't be done.

The finished hearth bottom.

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6 GOOD QUESTIONS ABOUT ALUMINUM TOOLING PLATE . . .

Recently, many fabricators have asked Kaiser Aluminum Distributors for more information about aluminum tooling plate. This interest has grown from the fact that tool design offers fabricators many opportunities for cutting production costs. Such cost-cutting depends a great deal on tools that maintain accuracy, are easy to handle, and are economical to fabricate. Kaiser Aluminum rolled tooling plate makes such tools possible.

In answer to your questions, here are some general facts about aluminum tooling plate . . . compliments of your Kaiser Aluminum Distributor.

★ ★ ★

Q. You say Kaiser Aluminum tooling plate provides more precise and economical tools, jigs and fixtures because it's machined and because it's rolled. What are the advantages of machining and rolling?

A. Because it's machined on both sides, this plate provides a flat base for accurate layout and measuring. Most layouts can be made directly to the as-received plate, thus saving labor. Because it's rolled, Kaiser Aluminum tooling plate offers a finer grain structure, complete freedom from open porosity, higher strength, finer finish and better welding characteristics. Also, this plate is stress-relieved so that any subsequent machining operations can be performed without fear of warpage.

Q. Is it more difficult to machine aluminum tooling plate than other metals?

A. No, aluminum tooling plate is one of the easiest metals to machine. It can be sawed, planed, turned, milled, drilled, tapped or filed at a much faster speed than commonly used ferrous metals. You save time and you save machine and tool wear. Using ordinary tool room equipment, the speeds at which metal may be removed is governed only by equipment limitations. Aluminum machines best at high speeds.

Q. Are there any particular tool room hazards encountered in using aluminum tooling plate? Are any special precautions necessary such as when using magnesium tooling plate?

A. Aluminum tooling plate is completely safe. Here's why: It's ⅔ lighter than its steel counterpart, so it's easier and safer to handle. It's nontoxic, so presents no problem to personnel. It's non-flammable, so no special precautions are required in handling grinding dust filings or saw chips. It's rust and scale free and needs only a small amount of lightweight lubricant or coolant to machine, so it's cleaner and easier to work with. It's a high conductor of heat, so dissipates heat more readily, reducing hot chip hazard while machining.

Q. How about storage? Are any special procedures necessary?

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A. R. Purdy Company, Inc.

AND 6 GOOD ANSWERS BY KAISER ALUMINUM DISTRIBUTORS

Aluminum tooling plate is rustproof so requires no special rust preventives. Tools may be stored bare, inside or out, or may be protected against dirt and dust by a coat of light mineral oil. However, all steel or iron component parts of jigs or fixtures should be protected against rust. Because aluminum tooling plate is lightweight, it permits storage of jigs and fixtures in higher stacks and releases valuable floor space for other uses.

I want to make a vacuum tight fixture to hold parts for machining. Can aluminum tooling plate be successfully used for this purpose?

Yes. Be sure to use a rolled plate to guarantee freedom from open porosity and blow holes sometimes found in cast products. Porosity in tooling plate can often necessitate time consuming and costly repairs. The rolling operation has the effect of closing and actually welding all of the open pores that might exist in the cast ingot.

I must make a larger fixture combining drilling and reaming operations and several locating points exposed to considerable wear. How can I do this and still keep weight to a minimum?

Rolled aluminum tooling plate is your best and most economical selection of material. Precision machined tooling plate will make an excellent base for the structure with little or no preparatory machining. Locating brackets may also be made of aluminum tooling plate with ground steel plate attachments for point of high wear, and steel drill on ream bushings pressed into the aluminum tooling plate as required.

MORE THAN A SOURCE OF SUPPLY

Your Kaiser Aluminum Distributor offers more than prompt warehouse service... he offers expert technical advice on choosing the *right* aluminum alloy and the *right* fabricating methods for your particular job. Problem solving is as much a part of his service as warehousing.

FREE BOOKLET. Your Kaiser Aluminum Distributor offers free information and technical data in an informative new booklet, *"Rolled Aluminum Tooling Plate."* This booklet contains all the facts on aluminum tooling plate—advantages, applications, design data, availabilities.

For your free copy, write on your business letterhead to the nearest Kaiser Aluminum Distributor named in the list below. Or contact: *Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.*

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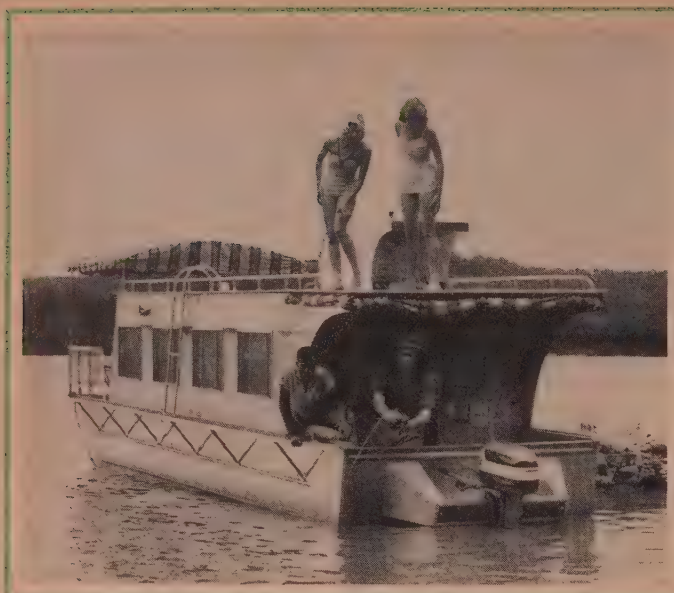

HOW WELDING PAYS OFF FOR BOAT BUILDERS

by D. L. Messersmith, Welding Sales Engineer, Linde Co., New Orleans, La.

◀ *Heavy gauge aluminum is used in welded hulls of houseboats by Richland Mfg. Co., Richland, Mo. Outfitted 32-footer sleeps 6, sells for $5750 without motor; 35-footer sleeps 8, costs $6800.*

THE PUBLIC golf courses are jammed; bowling is at the height of its popularity; tennis courts seem to be getting their fair share of racquet wielders; and the highways are more glutted with cars than ever. In spite of all this, the surge of new Sunday sailors in 1959 took the boat manufacturers by surprise. The season is over, but the orders are still rolling in. Why?

A major factor in the rising popularity of boating has been the increased use of aluminum and other metals in boat construction. Aluminum's strength, light weight, adaptability, fireproof qualities, low cost and maintenance-free characteristics have rapidly made it a favorite of both boat builders and owners.

Aluminum: One in Three

Last year there was a 13% rise in the amount of aluminum used in the fabrication of boats and outboard motors — making an estimated total of 47 million pounds of aluminum.

Aluminum has become so popular that industry sources say one of every three pleasure boats built in the U. S. today is made of aluminum. At the close of World War II, boat manufacturers turned from the use of traditional boatbuilding materials and the traditional production methods they entailed in favor of the use of modern production techniques for forming and joining leak-proof metal hulls. One leading manufacturer of aluminum pleasure boats discovered that by using Heliarc welding instead of riveting, joining costs were cut by 10c per linear foot.

A typical small aluminum boat is produced by the Vio-Holda Corp., Topeka, Kan. Using Heliarc welding, this firm increased production speed by 65%.

Seven different models are produced, ranging from eight to 14 feet in length. However, fabrication is similar in all models. First, the "dimpled" aluminum bottom and side sections are locked in a jig and joined with a Heliarc HW-10 torch and Oxweld No. 23 aluminum rod. Then pre-formed Heliarc welded ribs are positioned. Ribs, transoms, seats, braces and fittings are all attached with Heliarc.

Stainless steel boat hulls are also proving popular. Its corrosion-resistant quality makes it popular for both fresh and salt water boating. Longitudinal seams for the stainless steel craft are Heliarc welded to insure a watertight seal. Then an HW-10 torch fusion welds the transom to the hull. In the final operation ribs are attached to the sturdy 16-foot craft and seat brackets are spot-welded directly to the hull by means of HW-8 torches.

Richland Mfg. Co., Richland, Mo., states that no failures have been reported in their Heliarc welded small boats. These aluminum boats range from 12 to 16 feet in length and feature Heliarc welded transoms which are engineered to withstand great water pressure and motor vibrations.

. . . And a Houseboat

In addition to runabouts, the firm manufactures a popular 30-foot aluminum houseboat which features a Heliarc welded hull. More than 140 linear feet of Heliarc welds seal this watertight hull. Heliarc is also used in the fabrication of the keel, transom, water tanks and guard rails of these roomy craft.

Boat manufacturers who, prior to World War II, confined themselves to traditional boatbuilding methods and materials have found aluminum ideal for experimentation. Therefore, it is not surprising that many new develop ments in boat design and manufactu have taken place in this brief period.

If It's Clinker-Built . . .

Boat manufacturers have long inco porated the use of clinker-built or la strake hull construction in convention boatbuilding. This construction featur the overlapping of materials being use to cover the boat to produce an inverte step effect. The design is known for i seaworthy characteristics, even in roug water.

A later discovery of boat manufa turers was the use of step constructio in small hulls. These transverse ste raise the hull out of the water and allo the craft to plane the water rather tha ploughing through it.

Among the more revolutionary dev opments of boat design in recent yea is a new type of hull construction whi appears to be based on a union of the two staples of the trade, plus some cre tive engineering. Developed by Higgi Inc., New Orleans, La., the radical d sign is called the "polyhedral hull This development is incorporated in all-welded, all-aluminum boat whi greatly reduces wave impact.

According to the company, the hu contains a series of longitudinal ste which deflect water from the hull a provide progressive cushioning for t bow's downward movement. Higgins sa this new construction makes high spee and excellent maneuverability possib even in a rough sea.

Ten tons of aluminum alloy 54 were used in construction of the pro type craft. The hull was Sigma weld and the cabins were Heliarc weld Aluminum frames for the unusual h were first cut in the conventional sha then a set of serrations were cut in

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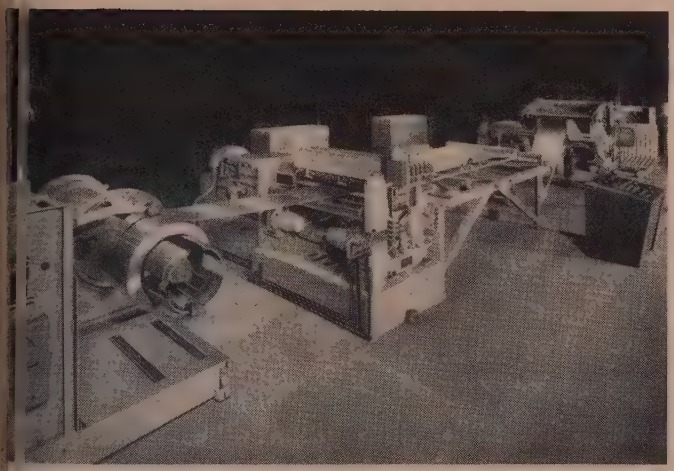

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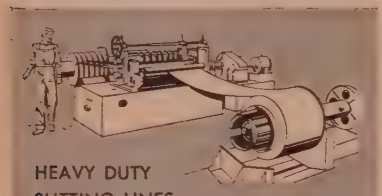
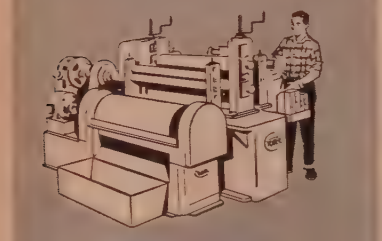

HEAVY DUTY
SLITTING LINES


SCRAP CHOPPERS

ENGINEERING YODER MANUFACTURING
ROTARY SLITTING LINES

outside edge of the frame, making the outboard of the frame resemble the toothed edge of a saw.

How They're Welded

Cold-formed 5456 alloy stringers were fitted into their proper notches and Sigma welded to the frames with an HW-11 torch. Plates of the same type aluminum were then joined to the saw-toothed ridges with HW-11 torches. After assembly of the hull, the cabin was fabricated of light gage aluminum with Heliarc welding.

Average welding speed for all welding was 15 ipm. Sigma power settings were 250 amp., 40 volts; Heliarc settings were 160 amp., 55 volts.

A single pass was enough for welds on the hull's interior. Weld seams were then back-chipped and a finish pass was made from the exterior of the hull. Exterior hull welds were ground smooth to assure flush surfaces at the seams.

Recreational boating's rising popularity has mystified even the boat manufacturers, many of whom were taken unaware by this year's record demand for boats and allied equipment. Many manufacturers report demand is far exceeding their potential production for 1959. Buoyed up by record sales, one leading manufacturer predicts that the number of people who participate in recreational boating will double from 37 million last year to 74 million by 1974.

This prediction is not hard to believe when we consider the figures. According to the Outboard Boating Club of America there are a total of 7,330,000 recreational boats on U. S. waters, and $2,085,000,000 was spent last year on boats, engines, accessories and related boating equipment.

These phenomenal figures are even more amazing when we consider that this 7.3 million figure represents an increase of 4.9 million boats in the last 12 years.

The boating boom has a number of causes. Modern materials and improved fabricating and welding techniques have helped reduce the cost of pleasure craft. A wide variety of boats, from runabouts to cabin cruisers, are now within the price range of the average American family.

A second factor is our general high level of prosperity. Because recreational boats are luxuries, boat manufacturers became a little wary when the recession threatened. But now that the economy is on an even keel and personal income is at an all-time high, future prospects for boating equipment manufacturers look better than ever.

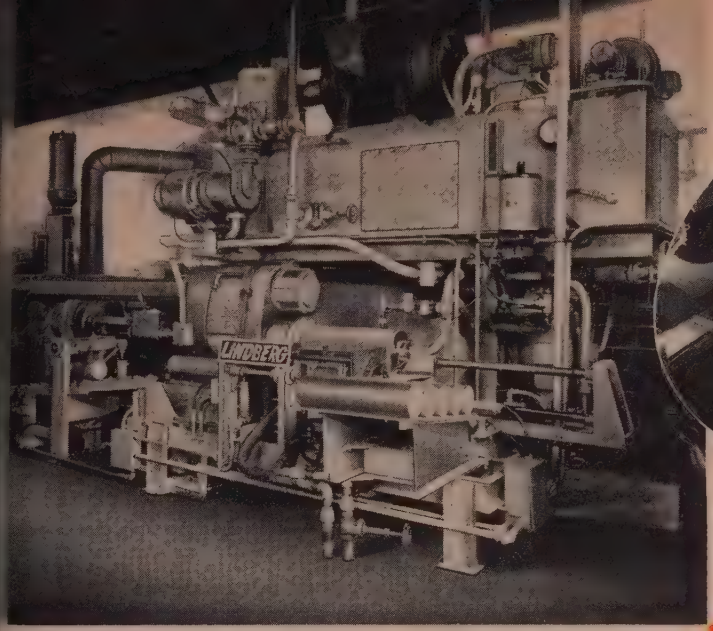
More Leisure Time

Another reason is the increase in leisure time. More leisure time and the availability of more money to be spent on recreational outlets have overtaxed existing recreational facilities. Therefore, more and more persons are turning to boating to escape overcrowded highways, swimming pools and golf courses.

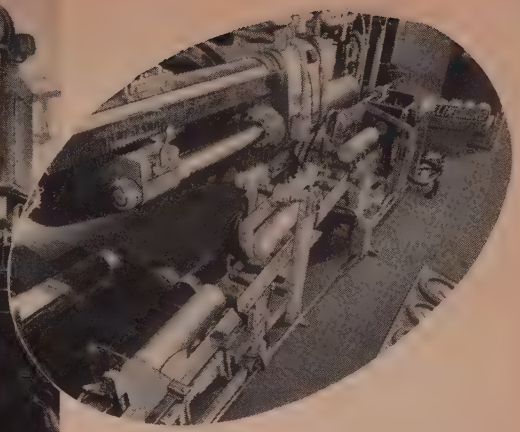
The dependence of allied sports on boating has also stimulated boat manufacturing. Fishing, skin diving, water skiing—all depend on boating for a measure of the enjoyment they provide. As these sports grow in popularity, boat sales grow with them. Boating is also a family sport, allowing the whole family to participate as a group.

Finally, boating's popularity may be explained in terms of the enthusiastic missionary effort of the sailors themselves. Through personal contact, the Coast Guard Auxiliary, Power Boat squadrons and industry organizations have done a thorough job of spreading the highly contagious pleasure-boat itch.

■ ***Commercial boat construction has made effective use of aluminum in recent years. The crew boat pictured above, made by Higgins, Inc., New Orleans, features the all-welded "polyhedral" hull. The welder at right is shown using a Sigma SW12 machine to join a stringer to a notch in the hull frame.***



Lindberg 60 cycle billet heater installation on extrusion press at Hazelwood Engineering and Equipment Co., Hazelwood, Mo.



Operation of Lindberg billet heater is fully automatic. Billets are automatically delivered to the coil, heated, cooled to desired temperature and delivered to the extrusion press.

r improving extrusion techniques

Lindberg's new 60 Cycle Induction Billet Heater

This new Lindberg 60 Cycle Induction Billet Heater provides the means of improving the efficiency and economy of your extrusion techniques. Lindberg designers and engineers have pioneered many important developments in induction heating. This new billet heater is another example of leadership in this field.

ere are some of its advantageous features:

- Major components are separated for efficient utilization of space around extrusion press area.
- Special BTU metering unit for close control of billet temperature.
- Automatic initial billet temperature correction device.
- Fully automatic cycling of loadin heating and discharge operations.
- Device for control of physical and extrusion properties of the billet.
- Maintenance is simplified because of accessibility to all component parts. Coil can be changed in less than 60 minutes. No thermocouple maintenance.
- Unit design for simple adjustment to accommodate various diameters and lengths of billets.
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- Rugged construction of all major components.

Bring your extrusion problems to Lindberg. Our engineering staff will provide a complete consultation service on the installation and start up of equipment and extrusion techniques to help you meet most effectively the standard specifications of the industry. Get in touch with your local Lindberg Field Representative (see your classified phone book) or write us direct.

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ALUMINUM TUBING TRUSS MAKES A LIGHT, AIRY SPACE FRAME

Structural oddity could point way to more economical buildings

← ■ *R. Buckminster Fuller, inventor of the geodesic dome, views construction of the "Octet Truss" at New York's Museum of Modern Art.*

A UNIQUE tubular aluminum structural system makes its debut at New York's Museum of Modern Art this month. Erected in the Museum yard, the space frame demonstrates a construction method that should offer substantial economies in industrial. institutional and military building.

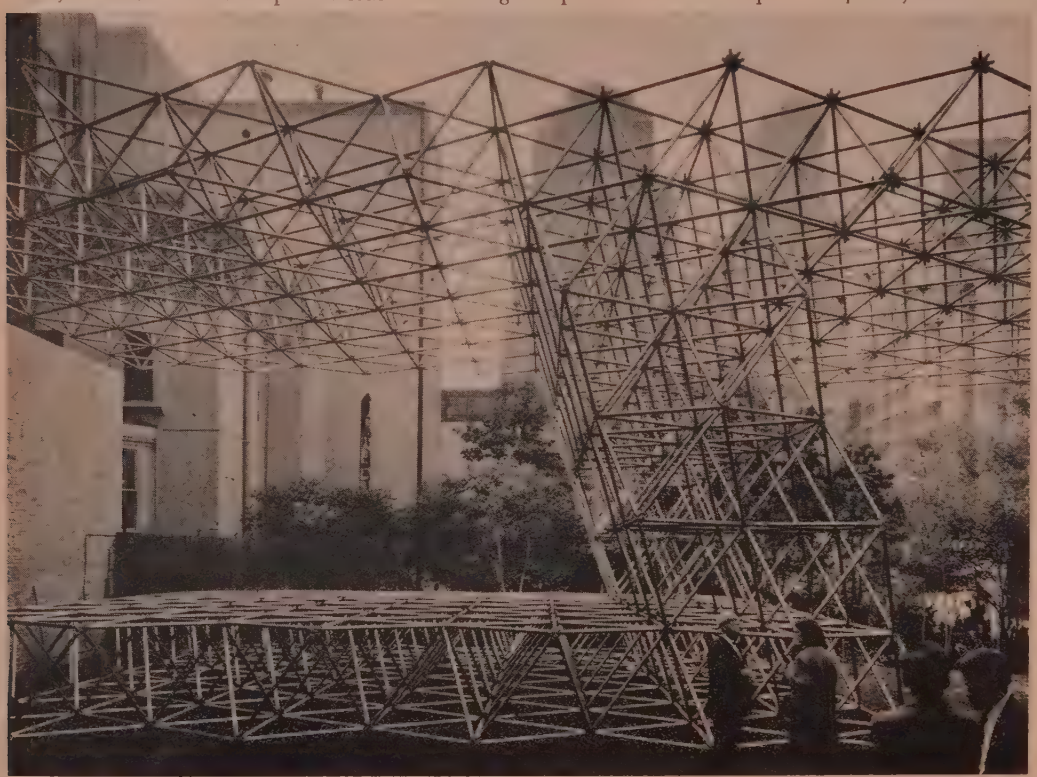
The structure, measuring 100 feet long and 35 feet wide, and cantilevered 20 feet above the ground on a single support, embodies the geodesic design concept of R. Buckminster Fuller. He calls this particular assembly the Octet Truss, because it is made up of a combination of eight-sided figures (octahedrons), and four-sided pyramids (tetrahedrons).

Three-way distribution of stresses grants extraordinary flexibility in construction. Additions can be made in many directions and supports can be placed almost at random instead of being regularly spaced as in conventional buildings. Airport hangars, shopping centers, schools, sports arenas and factories are some of the types of buildings which might use the technique advantageously.

Having a top surface of 3500 square feet, the space frame weighs only 880 pounds, yet is capable of carrying maximum snow, ice and wind loads by specifications of the New York City Building Code.

It is made up of 2380 aluminum tubes with cast aluminum insert ends. Each assembly unit weighs 3.7 pounds. For the purposes of this display, which will extend through the balance of the year, they were given a gold anodized treatment.

The tubes were fabricated from a new high-strength alloy, Alcan B51-S, developed by Aluminium Limited (see MM



■ *Octet Truss newest application of Buckminster Fuller's geodesic design, shown on display at Museum of Modern Art, New York. Cantilever design uses truss upright for its sole support. Substantial building economies could be gained, using this system.*

59, p. 52). The alloy combines
extruding speeds with good weld-
ity and design versatility — all of
ch, according to Fuller, recommend
or many structural applications such
he truss.

uller believes that the truss is par-
ularly applicable in commercial build-
wherever horizontal design is the
jor factor. This, he says, makes the
et Truss suitable and economically
ctical in building flooring and roof-
up to 1000 feet in length.

Major advantages in using aluminum,
ording to the designer, are its light
ght, strength, economies derived from
e and speed of handling, and the fact
t it will not rust and is virtually
intenance-free.

w To Halve Costs

Fuller estimates that if the aluminum
ss were to be used as the basic frame-
rk for present day airport hangars
d terminal buildings, overall construc-
n costs could be reduced as much as
%. He said the structure could be
ored over for a total weight per
uare foot of less than 10 pounds, com-
red with conventional large-span in-
strial flooring, which runs about 100
unds per square foot.

The designer believes that a helicop-
could transport a completed truss
the same dimensions as the display
it, and that smaller assemblies have a
ture in low-cost housing. Almost any
pe of skin can be aplied to the frame-
ork.

Aluminium Limited identified the
ew alloy as being in the magnesium
licide group, and possessed of high
rength. The tubes are 2 inches O.D.,
ith a wall thickness of about 3/32-inch.
ircraft type fasteners were used and
stalled with hydraulic tools. Tube
bricator was the R. D. Werner Co.,
reenville, Pa. Arrow Aluminum Cast-
gs Co., Cleveland, produced the tube
d fittings.

Two other structures embodying
uller's patented concepts complete the
Iuseum's display. One is the Rigid
adome, used to house radar equipment
long the Distant Early Warning Line
the Arctic.

The other is a mast constructed of
luminum and Monel rods, built by
hoji Sadao and Edison Price, Inc.,
ghting specialists, of New York. The
ast is made of aluminum and Monel
ods in web design which grants un-
recedented strength in relation to
eight. Employing Fuller's use of "dis-
ontinuous compression, continuous ten-
ion," the rods are assembled in such a
ay that the compression members do
ot touch one another.

4 more cost-cutting examples of

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IN LARGE AIRCRAFT SECTIONS THIN magnesium castings fill the bill

Two-stage development program creates cast magnesium landing gear doors for fighter plane; proves out cost-cutting, weight-reducing potential of foundry technique. Test and production details given in paper at this year's Magnesium Association Meeting in New York.

by A. J. Iler, Castings Engineer, Norair Division, Northrop Corp.

THE selection of materials for airplanes and missiles is a complex problem. The designer cannot afford to choose indiscriminately lest he incur overweight, cost penalties, or materials incapable of proper performance. Recent developments in magnesium metallurgy give evidence of producing casting alloys which exhibit significant increases in mechanical properties at room and elevated temperatures.

Airframe structural engineers are seeking ways to utilize this low density material for more airframe components, mindful of the truism that lighter airframe structures result in superior performance, lower maintenance cost, and more instrumentation.

With this objective in mind, Air Materiel Command, Wright-Patterson Air Force Base, Ohio, granted two research and development contracts to Northrop Aircraft, Inc. (now Norair) for the development of a typical airframe structural unit which would be moderately stressed under normal conditions and would be broadly typical of counterparts on the majority of military aircraft. The main landing gear door appeared best suited because of its ready comparison to wrought assemblies and because of its universal application.

Work on the first contract was begun in 1953 with redesign of the F-89 main landing gear door from a fabricated assembly to an integral casting. Purpose of this program was to develop feasibility from the structural standpoint. Considerable study was devoted to design details, stress analysis, and the general concept of a casting as a structural unit.

The Real Objective . . .

Feasibility of the foundry aspect was not the prime objective in the first effort. The founder, after several attempts to resolve venting, gating, and warpage problems, produced two castings which were considered satisfactory for the purpose. While they contained discontinuities not acceptable in a production casting, it was decided that the program would be expedited by accepting these castings for static testing.

One of the specimens was fitted with hinge brackets and door-lock rollers a production assembly jig. A test j with actuating mechanism was modifi to permit static loading of the cast doo The specimen was mounted on the te jig and rigged comparable to the bui up door.

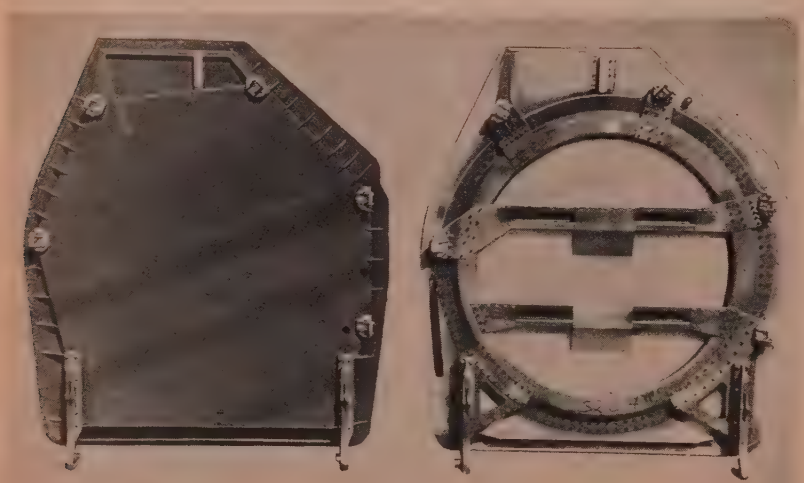
A "pre-warp" was simulated equiv lent to a production door assembl With the cast door properly rigged, required 1700 to 1800 psi in the hydra lic actuating cylinders to close and co pletely latch all door hooks.

The next test applied uniform po tive pressure to the outer skin with th door closed and locked. The test a paratus distributed 3 psi pressure to th door surface at limit load. Deflectio and permanent set recorded by 16 di indicators on the inner skin showed negligible permanent set after applyi 110% of limit load, 3.3 psi.

Another test applied a non-uniform distributed, and positive load to th same surface. This load, which reacte through the hinges and actuator attac ments, was to approximate a theoretic 1600-pound load condition, simulatin the airload developed when the door open in flight. The maximum perm nent set was .021 inch at the inboar aft lock-point — in the hinge bracket not in the door itself. Nearly all of th door indicated a zero permanent set.

Still another test applied a uniform negative pressure to the outer ski simulating more actual service cond tions than previous tests. Limit loa was 5 psi or about 11,500 pounds un formly distributed. Loading was ca ried to 162% of design limit before th door unlatched, and deflection range from .146-inch to .479-inch with permanent set of .040-inch maximum A cyclic test later indicated that th door could safely pass a normal servic test without difficulty.

The door was then loaded for de struction. Loading was carried to 270% of limit and the door again unlatched The door was again locked into positio and secured against unhooking. It too 243% of design ultimate load befor



■ *Northrop Aircraft (now Norair) was granted two research and development contracts in 1953 to explore feasibility of using magnesium integral castings in place of wrought assembled aircraft parts. Here, a cast magnesium landing gear door (left) is compared with its wrought assembled counterpart.*

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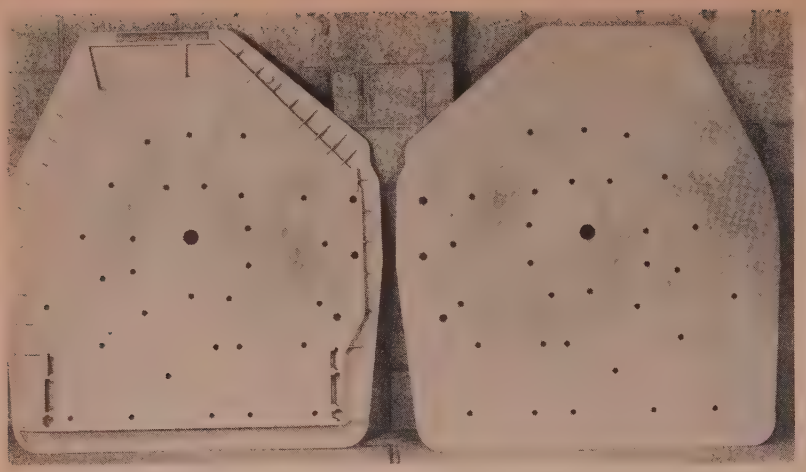

■ ***Shown here are both sides of cast landing gear doors, pictured before core support holes were plugged. Magnesium alloy AZ91-T2 was used; unit weight is 52 pounds; over-all dimensions are 54½ x 49½ inches, with wall thicknesses of .090 - .120 inch. The door is made of two skins with a minimum separation of one-half inch; maximum separation of 1¼ inch.***

the test apparatus broke which prevented further testing. Except for some additional permanent set, the casting remained intact.

Conclusions resulting from the first program were that a casting of this type would be feasible for production as a sand casting but that further research would be necessary; that the door can be produced with comparable strength, greater rigidity, and less weight than its wrought counterpart; and that foundry capability would have to be further developed to insure adequate sources and product reliability.

Needed: Environment Tests

The second contract was begun in 1956 to produce a token quantity of acceptable castings and to machine and assemble such castings to permit installation in an F-89 airplane for flight and environmental tests by the Air Force.

Static testing of the first door indicated that it was overstressed. Therefore, some redesign was made to remove weight. Adjacent webs were also altered for redistribution of loads. Some adjustment of core support and shear web holes and changes in skin thickness were also made as a result of specific molding problems encountered in the first program. More positive interlocking of the cores was achieved by elongating the holes in the shear webs to prevent core movement when the mold was poured.

Rolle Manufacturing Co., Lansdale, Pa., was selected as the participating foundry.

Pattern equipment developed for this project consisted of a cope and drag hard wood pattern, ten booked core boxes, and bedding frames. A flush pin gage was included to determine the accuracy of core placement. Ram-up cores were produced to receive the core support buttons in both cope and drag. Special flasks were made with approximately 12-inch mesh of welded steel gaggers to reinforce the cope.

The molding process utilized AFS #70 silica sand for facing, with a back-up of #57 for optimum mold permeability. A 4 to 5% moisture content was indicated, and the clay binder was of about the same percentage.

To eliminate retained core gas in the mold, several core binders and grain size mixes were experimented with to determine the maximum permeability and collapsibility of cores which would remain dimensionally stable after baking and would not break up during core placement. The optimum appeared to be a mixture of equal amounts of AFS #60 and #120 mulled together with a urea-formaldehyde binder.

The cores were oven-baked since wire reinforcements precluded the use of the dielectric oven. Chaplets made of ⅛-inch round fusible magnesium rod were used where needed in the peripheral areas to help stabilize the thin cores. Heavy sections were copiously chilled with cast iron where a direct feed from a sprue runner or blind riser was not expedient. Carbon blackening was used to increase fluidity of the metal during pour-off.

Gating consisted of two pouring basins rammed over two ends of the cope. These sprued to four down gates at the mold corners which led to 4 by 4-inch sumps, two inches deeper than the runners. One runner to each down gate extended the length of a mold side, feeding sprues running radially over the shear webs in the casting. Sprues diminished in size toward the casting center. Except for vents, all risering was blind.

Performance of this program tends to focus attention on the general scope or parameter of problems which it typifies. It would be the height of unwarrantable boldness to presume that a magnesium casting with over 410 square inches of webs measuring .090 to .130-inch thick could be cast without flaws or extreme difficulties. Here is where the chief significance of this program may lie.

Emphasis should be placed upon the fallacy of creating an arbitrary design be it ever so conforming to the best known casting design concepts, and allowing it to remain unmodified to compensate for unforeseeable contingencies during casting. Each new design of this magnitude is a new project with unpredictable problems.

Founders are understandably reluctant to spend hard-earned dollars to solve these problems unless there is a reasonable chance of a production run of castings whereby the expense may be recovered. On the other hand, potential customers very often cannot offer such assurance until extensive testing has been done.

In fact, projects of this nature have a tendency to create new products, or products designed around the casting. It follows then that a pooling of the designers' forward thinking with the capability of the founder is indispensable to the successful production of the casting.

The most serious problem encountered in this program was gas pressure in the extensive core area which, except for small core support buttons, was entirely surrounded by metal. Binders, sands, baking cycles, and reinforcement were varied exhaustively in an effort to fill the mold.

The old familiar core binder of linseed oil and kerosene was tried, in the hope that a quick chill would solidify the casting before the slower, if greater rise of gas would form counter pressure. To aggravate this situation, the slightest core floating would, percentage-wise, drastically reduce the nominal .090 to .130-inch skin in the cope side which covered an area of 2500 square inches.

The fact that the successful castings were produced with molds which used essentially the original gating system is a tribute to the founder.

Teamwork's the Thing

Norair's producibility engineers were a part of the team. Each problem was discussed with the founder as it arose. If the problem appeared to be recurrent—a phenomenon over which the founder had no practical solution—changes were made in the design. These changes were very minor and had no significant effect on the function of the part, but they were essential to the success of the foundry work.

(*Continued on page 58*)

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■ *Another test casting produced by Norair was this 16-foot cast magnesium wing. Tests indicated that the major shrinkage discontinuities found in the fracture of the wing casting, which failed in a static test, did not impair performance of that casting at 125% of design limit load.*

The most drastic change increased the casting wall thickness tolerances, allowing the founder to add material in some sections of the cope half. If the cores floated, the skin was very nearly nominal. If they didn't, a slight increase in weight occurred.

A significant result of this close cooperation was a careful scrutiny of discontinuities and defects which might not be acceptable in a simpler casting. Due to the improbability of perfect castings of such magnitude and complexity, a fresh evaluation of repair methods or acceptance without repair becomes mandatory.

Minute misruns and non-linear cold shuts sometimes have very little effect on performance. Discontinuities noted on the castings used for static testing were much larger than would normally be considered, and yet the casting tested in excess of 200% limit load and did not develop cracks resulting from linear defects when tested by cycling. (These "linear" defects were not cracks, but were probably cold shuts.)

Need Perfection?

The experience of many users of magnesium alloy castings who have suspected, without justification, that even moderately imperfect castings will not perform adequately, should alleviate some of the stigma resulting from isolated conditions of depressed metallurgical quality and attendant low mechanical properties of standard test specimens representing those conditions. The ability of castings to redistribute applied stresses in sections containing metallurgical discontinuities minimizes the deleterious effects of such discontinuities.

Particularly significant in this regard is the high incidence of shrinkage noted by radiographic inspection. While the castings made in the second portion of this program were particularly free of mass concentrations of shrinkage—partly attributable to the alloy, AZ-91 — the test castings produced for the first portion were poured of AZ-63, and contained shrinkage indications dispersed over 75% of the castings.

This high incidence of shrinkage is fairly representative of large magnesium castings containing large, thin walls. It should be noted that static test failures usually occur in concentrated stress areas where there is attachment or articulation rather than in large web areas.

Static Testing Needed

Norair, in contract with W.A.D.C., produced a 16-foot cast magnesium wing (illustrated), and of the 827 radiographed test specimens, 97% contained shrinkage discontinuities. The major discontinuities found in the fracture of the wing casting which failed in a static test did not interfere with the successful performance of that casting at 125% of design limit load.

It appears, then, that large, thin-walled magnesium castings are functionally reliable with an indefinite amount of discontinuities; that static testing is the logical method to provide engineering and inspection criteria whereby acceptability can be determined in terms of complete stress patterns rather than isolated sections; that the castings thus tested should represent a typical foundry product within practical limits; and that the product should be the result of cooperative action between engineering producibility person and the founder to secure the maxim utilization of the founder's skill.

The finished and assembled cast weighed 54 pounds. When compa with the fabricated door, which weigh 69 pounds, a saving of 30 pounds airplane (two doors per ship) could effected. In terms of monetary wei values on a new airplane, this wo more than offset the entire cost of component itself.

In conclusion, design capability a foundry capability are dependent up each other. Because of the advanc skill of some foundries whose produ are geared to the current demands the airframe industry, it may be nec sary to select the foundry prior finalizing the design. This may even practical and profitable when carried the point of first creating a specificati drawing. This would require submit of detailed drawings from the found to encompass the optimum of th individual capability.

The Score Today

Significant advances have been ma in foundry technique during the l half decade. Large, thin-wall, lig weight, cast airframe components adaptable to the most advanced a frame design. Much of the mystery the fluid dynamics of molten met progressive solidification, molding m dia, and heat-treat technology has be cleared away. While casting is still art, many of the process elements reduced to something close to a scien

On the other hand, there is nothi like a failure on a project like this cause aircraft manufacturers to vi castings with a jaundiced eye. The b way to prevent this is to have the signer and the founder on the sa team. The result may be somethi less than the designer envisaged, b the important consideration is that product is usable, more economic lighter, and more reproducible th most fabricated assemblies. It sets trend which certainly enhances level of airframe structural quality a reproducibility.

If I may quote Howard Perkins: "M takes have been made, and no dou mistakes will be made in the futu But the potent driving force of a you but thoroughly shaken-down indus will carry magnesium toward full m turity, greatly benefiting all who m lift or move anything on earth."

The airplane industry must produ vehicles which "lift and move" abo the earth. There is no scientific reas why much larger cast magnesium a frame components cannot be used, p vided reliability of product and sou continues to develop proportionat

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◄ *Hydramatics, Inc. uses aluminum to reduce weight of these ball valves.*

SELF LOCKING thread inserts made of stainless steel have made it possible to exploit the weight-saving advantages of aluminum in a new family of control and fuel valves designed expressly for missiles, rockets and high performance aircraft. Since the valves serve in airborne applications as well as ground support equipment, every ounce of weight eliminated is of utmost importance. That's why aluminum is used.

But service conditions are especially severe when handling rocket fuels such as liquid oxygen (LOX). Temperatures dip to a frigid —400°F, and pressures may range from vacuum to 10,000 psi. When you add extreme vibration over a wide frequency range, you have an environment that can shake loose the tightest threaded connection.

Screw-Lock inserts not only solve the vibration problem in ball valves manufactured by Hydromatics, Inc., Livingstone, N. J., but also simplify assembly and prevent stripping of tapped threads in the machined aluminum valve bodies. The self-locking thread inserts made by Heli-Coil Corp., Danbury, Conn., also eliminate the need for lock washers, lock nuts and wiring.

The Hydromatics valve employs a floating ball with an axial hole whose surfaces are always in sealing contact with the valve seat. All pressure loads are absorbed by a pair of precision bearings in which the ball rides. The ball is rotated by an actuator mounted directly above the valve body.

Opening or closing the valve causes a self-wiping, self-locking action that insures a long, trouble-free life and makes a bubble-tight flow control under wide range of operating conditions.

With quarter turn operation, manual, motor or pressure actuators can be interchanged without changing the valve body. The actuators can be thermally isolated from the valve body to insure positive action when handling ultra-low-temperature materials such as LOX.

As in all airborne equipment, weight and space considerations are of paramount importance. Hydromatic valves are designed to be as compact and as light as manufacturing process permits. While high-strength aluminum alloys are used for most aircraft valves, bronze, stainless and high-strength steels are used for some special applications.

The 1½-inch Hydromatic liquid oxygen valve for "topping off" operations in fueling missiles must work at pressures to 1500 psi. It has 24 threaded connections in the valve body, which is machined from aluminum bar stock to a 4 x 4 x 4 inch cube and th anodized by the sulphuric acid proc Threads tapped directly in this alu num body would deteriorate rapi from the high torques used in assemb

Preliminary operations for instal tion of the inserts are integrated w Hydromatics production line. First st for installing a ¼-28 Screw Lock ins is drilling a .257-inch diameter ho tapping with a special Heli-Coil t and countersinking. The insert is turn into the hole with a prewinder tool. T last coil of the insert is located sligh below the top thread of the hole.

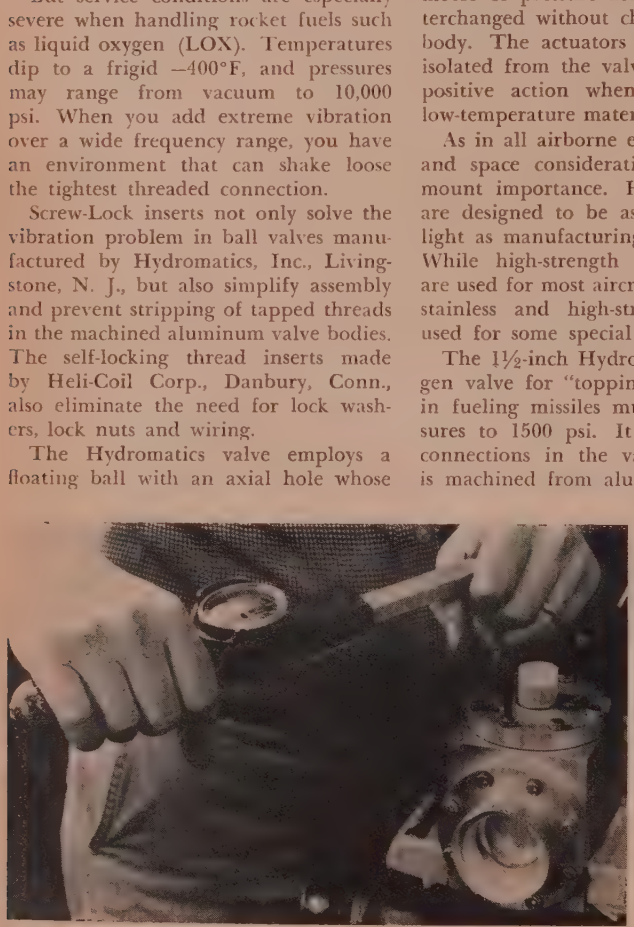
Because the free outside diameter the insert is slightly larger than t inside diameter of the threaded h into which it is installed, spring tensi retains the insert securely in the hole

Flexibility of the insert provides sembly stablity during exposure to alt nate freezing and thawing conditions a valve handling cryogenic (low te perature) media. To keep the stainl Allen head bolt under tension, sm Invar spacers are incorporated.

In addition to providing locking serts for the inlet and outlet flang three Screw-Lock inserts also prot threads on the cover where the actua is attached to the valve top.

All connections in the valve flan and cover are held securely agai loosening by a grip coil near the c ter of the Screw-Lock insert. One more of these polygonal shaped c are forced to assume a circular sha as the screw passes through the ins This creates a gripping effect w minimum loss of locking action throu many cycles of disassembly. The b may be readily removed by apply break-away torque approximately t same as assembly torque.

Like regular Heli-Coil inserts, Scr Lock inserts are made from 18-8 st less steel wire having an ultimt strength of about 200,000 psi. T conform with military specifications locking torque and vibration.



■ *To prevent galling, stainless socket head screws are coated with Fluorlube, then run in by hand as far as the grip coil to position gaskets and flanges. Then, using torque wrench, each screw is tightened to 120 inch/pounds.*

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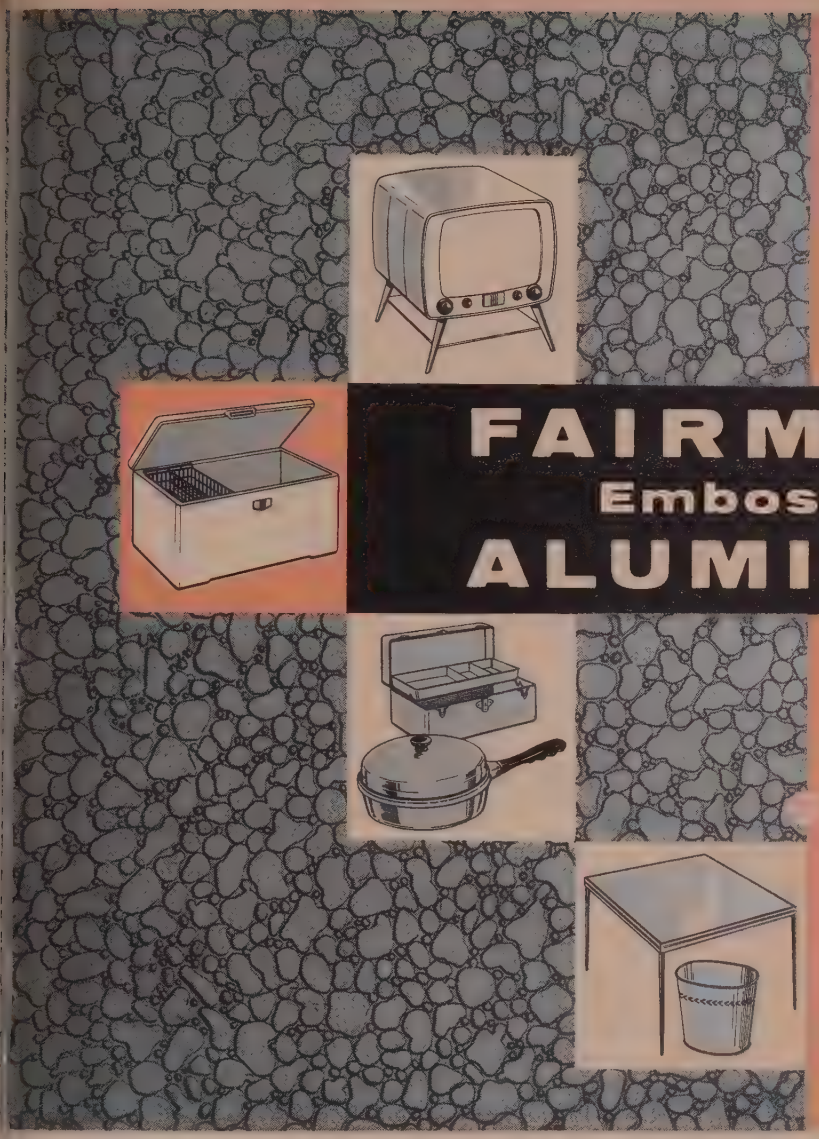

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ALUMINUM'S GAINING GROUND . . . IN THE PETROLEUM INDUSTRY

By
M. E. Carlisle, Jr.
Aluminum Co. of America,
New Kensington, Pa.

Whether for permanent or semi-permanent lines, aluminum piping is cheaper to install than steel, takes less labor, generally requires no protection in buried systems, and is more resistant to corrosive atmospheres. The light metal shows promise in other petroleum industry applications, including pressure vessels and tankage.

ALUMINUM alloys have many characteristics which favor their use in petroleum operations, and increasing use is being made of them. The use of tubular products in the petroleum industry is enormous. Portable piping such as that used for drilling rig supply is a typical application in which aluminum's lighter weight can result in substantial savings, for such pipe lines are handled manually—frequently over rugged terrain, and may be moved several times during its life.

A comparison of the cost of laying and picking up three miles of 2½ in. Schedule 5 aluminum pipe (26 pounds per 30-ft. length) and 2-½ in. Schedule 40 steel pipe (174 pounds, same length) is shown in table 1. These data are based upon actual installations and, although variations in certain conditions will affect the comparison, figures shown are fair averages. The aluminum pipe was joined with a quick-acting type of coupler, and the steel with threaded connections, inasmuch as these were the usual joining methods used in the field. The smaller crew and the shorter time required for laying aluminum pipe provide the large saving in labor cost.

The smaller number of truck hours is based on the faster speed of laying the aluminum line and because more feet of aluminum pipe could be carried per truckload. The latter factor is due to the truck capacity being determined by weight in the case of the steel pipe and by volume in the case of aluminum. Since the three miles of aluminum pipe cost only about $1,400 more than the steel, two moves will nearly make up the difference and from then on savings will result.

Semi-Permanent Piping Systems

Light-wall aluminum pipe is also being used for semi-permanent piping such as that on production leases. Tank-battery piping is one market in this category. Fig. 1 shows some aluminum tank-battery piping in the Citronelle, Ala. area where about 70 miles of Schedule 5 aluminum pipe have been installed. Here light weight and ease of coupling justified use of aluminum, even though the pipe is not expected to be moved frequently. The use of aluminum pipe for vent lines in sour-crude production is particularly suitable, because aluminum is not attacked by moisture-laden carbon dioxide or hydrogen sulfide vapors.

Caution must be exercised in using light-wall aluminum pipe for semi-permanent piping, because corrosion considerations are much more important in such cases than for portable systems. The characteristics of the material to be handled, as well as the soil with which the pipe will be in contact, must be considered. If an electrolyte is to be present, protective measures should be taken where aluminum pipe is connected to dissimilar metals.

Permanent Piping Systems

Aluminum has a major use in permanent pipelines and is used in flow lines and gathering systems. The best means for joining permanent pipelines is usually circumferential welding. Table 2 lists actual costs for semi-automatic consumable electrode roll welding of an 8 in. Schedule 40 aluminum pipeline in the field. The comparative data for metallic-arc position welding of in. Schedule 40 steel pipe is the result of discussions with several pipeline contractors, including the one who installed the aluminum pipeline.

■ *Aluminum tank-battery piping is a major application of aluminum in the petroleum industry.*

The case for steel is not based upon roll welding, for most contractors contend this technique is uneconomical with steel pipe. It has been found that the lighter weight and lower modulus of elasticity of aluminum permit roll welding with savings over position welding. The lower welding cost for aluminum is the result of both the smaller crew size permitted by the lighter weight and the shorter welding time with the consumable-electrode process. In the case of the aluminum pipelining from which the data in Table 2 were obtained, the welding time for completed joints was as low as 6 minutes. Fully automatic consumable-electrode pipe-welding equipment is now available which can weld with even greater rapidity.

In the past aluminum has suffered a competitive disadvantage in comparison with steel for welded piping systems because of the reduction in strength heat-treatable aluminum alloys caused by the heat of welding. The tensile strengths of standard pipe alloys 6061-T6 and 6063-T6 are reduced in the local area by approximately 37% and 42%, respectively.

Although the area is only a few inches wide, when aluminum pipe has been joined by circumferential welding, it has been necessary to base the design of the entire pipeline on the reduced mechanical properties. This fact results in the wall thickness over most of the piping system being considerably more than required.

Now tubular products can be produced with an essentially uniform inside diameter and varying wall thickness. Using this technique, pipe can be made with Schedule 40 dimensions at the ends

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TABLE 1. Laying and Pick-up Cost Comparison for 3 Miles of 2½-in. Drilling-Rig Supply Pipe Schedule 5 Aluminum Vs. Schedule 40 Steel

	Aluminum Schedule 5 Quick-Coupled	Steel Schedule 40 Screwed
Crew size	3	5
Man-hours	27	120
Cost per man-hour	$2.50	$2.50
Total Labor cost	**$67.50**	**$300.00**
Truck-hours	9	12
Cost per truck-hour	$5.00	$5.00
Total truck cost	**$45.00**	**$60.00**
Total laying cost	$112.50	$360.00
Total pick-up cost (1.5 times laying)	$168.75	$540.00
Total cost	**$281.25**	**$900.00**
Cost saved with aluminum	**$618.75**	

where the heat effect of welding occurs, and with reduced wall thickness elsewhere full -T6 properties are maintained. Substantial reductions in weight and cost can be achieved for welded piping systems.

Alcoa calls this new product Alcoa Unistrength Pipe. The name is intended to convey the idea that one level of strength exists—there are no "weak links" at the welds The ratio between the thick and thin walls is so chosen as to give uniform strength throughout a welded piping system. Unistrength grants a 35% reduction in weight over standard Schedule 40 pipe.

The development of a new product to overcome the loss in strength when heat-treatable alloys are welded together with the lower welding cost for aluminum pipe, can combine to make aluminum competitive with steel for permanent piping systems. A cost comparison between 8 in. alloy 6061-T6 Alcoa Unistrength Pipe (Schedule 40 ends) and 8 in. Schedule 40 seamless steel pipe for an underground pipeline would show how lower construction costs for aluminum reflect the comparison in Table 2 on welding costs.

Construction costs attributable to such operations as clearing and ditching depend upon the terrain; the values here are based on some published data for flat, open terrain. There is no freight for the aluminum pipe, since the freight is included in the price. It is assumed the soil in which the pipe is to be buried is compatible with aluminum and no coating or wrapping is required; this assumption is a reasonable one in a large majority of locations.

Using as an example the pipeline cost comparison of 8-inch Unistrength vs. 8-inch Schedule 40 steel pipe, cost per foot in aluminum is $4.79; for steel, $4.61.

With the premium for aluminum only 4% in this case, it is obvious that very little additional advantage is needed to make it the more economical choice. If aluminum can provide just slightly better resistance than steel to the corrosive effects of the media being handled, the longer life will put it out in front.

The comparison just given is for a particular situation. Admittedly, aluminum pipe cannot always compete this closely with steel for permanent pipelines. However, it emphasizes that the cost relationship is such that if any of the characteristics of aluminum are particularly desirable for a pipeline (e.g., if aluminum is especially suitable for handling the fluid in question), aluminum may well provide more "pipeline transportation per dollar" than steel and, therefore, should be carefully considered.

Aluminum's lighter weight is an advantage for overhead permanent piping, since it permits lighter supporting structures. Also since the friction factor for aluminum pipe is less than that for steel, important economies can sometimes be realized with a lower pressure drop.

Several experimental permanent aluminum pipelines have been installed. The first aluminum crude-oil gathering lines were laid in Louisiana and Arkansas about 1948. These early lines were buried. In 1954 an above-ground crude oil flow line was laid in Louisiana marsh country. A bare aluminum gas flow line has been in service on the bottom of Matagorda Bay, Texas, since 1950. In the fall of 1956, 20,000 feet of 8 in. aluminum pipeline were buried as part of the gas supply network to Alcoa's smelter at Point Comfort, Texas.

Fig. 2 is a photograph of the 8-inch Point Comfort line being laid. Both tungsten-arc and consumable-electrode equipment were used for welding this line, and the higher speed of the latter was most apparent. No external coating or wrapping was applied, but experimental magnesium anodes are on isolated sections to determine appropriate levels of cathodic protection if inspections indicate a need for it.

It is difficult to decide if aluminum pipe should be buried bare in a particular soil. Most experience with aluminum in contact with soil has been favorable; and apparently in a large majority of locations, bare aluminum pipe will do a good job. However, soils vary too widely in composition to permit the formulation of any general criteria.

It is suggested the results of some experience with a soil indicating its compatibility with aluminum be available before deciding to bury a permanent aluminum pipeline bare. The relatively inexpensive technique of cathodically protecting aluminum pipelines promises to be highly effective and may eventually permit burying bare aluminum pipe in even the most aggressive soils.

Other Tubular Products

Small-diameter drawn aluminum tube offers significant savings over conventional materials for instrumentation and control lines. Size for size, for comparable mechanical properties, the price of aluminum is about one-half that of copper for this product. Many field installations of separator control lines in sour crude areas are aluminum because of aluminum's good resistance to the action of hydrogen sulfide vapor. Some aluminum tube is known to have been in this type of service for eight years.

Aluminum has a good potential in heat exchangers. The conventional m-

TABLE 2

Comparison of Pipeline Welding Cost—Aluminum Vs. Steel

Aluminum — Semi-automatic consumable-electrode roll welding (three welds per hour):

	Cost per Hour
1 welder	$3.50
4 laborers	6.00
Argon gas	2.43
Welding electrode	1.41
Total cost per hour	$13.34
Cost per weld	$4.45

Steel—Metallic-arc welding (two welds per hour):

	Cost per Hour
1 welder	$3.50
5 laborers	7.50
Welding rod	.58
Total cost per hour	$11.58
Cost per weld	$5.80

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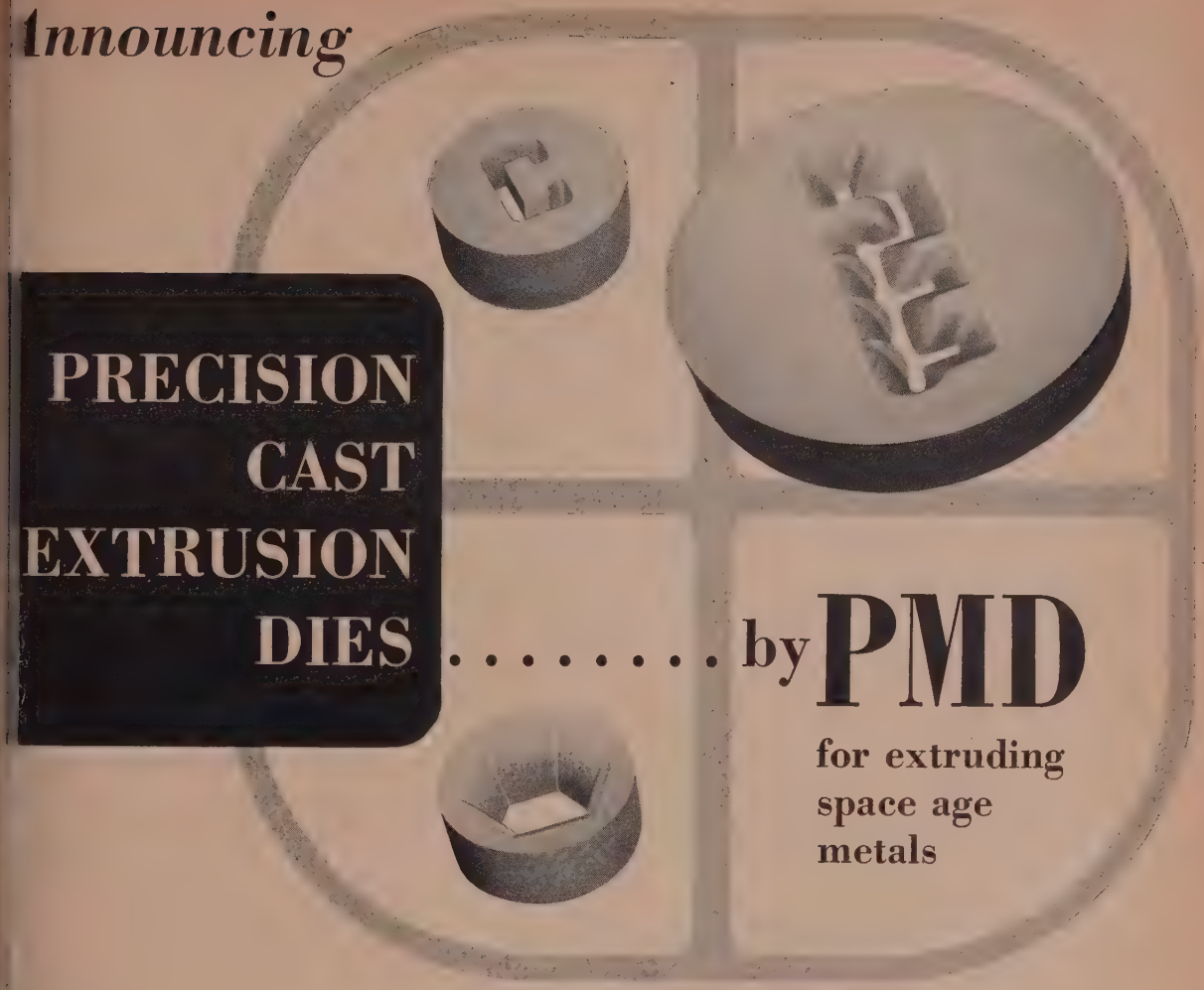

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■ *First section of new gas gathering system pipe line at Alcoa's Point Comfort station is shown (left) positioned in a new automatic welding machine. When joint is completed, the 8-inch pipe is pulled through the machine. At right, Alcoa engineer is making final adjustments to the head of the new welding machine. The high speed unit completes a pass on 8-inch pipe in 17 seconds. Forty-foot sections of this size pipe are welded without use of backup rings. The aluminum line will be buried without coating or wrapping.*

terials for heat-exchanger tubes in refineries are Admiralty metal and mild steel. Admiralty metal is restricted mostly to water exchangers, whereas mild steel is used for petroleum products. Aluminum heat-exchanger tubes are less than one-half the price of Admiralty metal and about 30% less than seamless steel. Alclad aluminum tubes also have been developed for water exchangers.

Steel is used for about 50% of all refinery heat-exchanger tube installations, Admiralty metal for about 48%, and other materials share the remaining 2%. A modern refinery utilizes approximately 40 lineal feet of heat-exchanger tubes per barrel of daily capacity. Aluminum tubes should be suitable for nearly all the exchangers where Admiralty metal tubes are presently used and one-half the installations where steel tubes are chosen, or, in total, about 30 ft. of the 40 ft. required per barrel.

At today's prices the use of aluminum heat-exchanger tubes instead of Admiralty metal or steel in a new refinery should save about $4.50 per barrel of daily capacity. Most major oil companies either use aluminum heat-exchanger tubes or have them in test installations under various conditions. Aluminum heat-exchanger tubes have proved to be ideal for catalytic cracking overhead condensers and compressor inter-coolers and after-coolers.

Pressure Vessels and Tankage

Aluminum cannot normally compete with mild steel for pressure vessels and tankage if unprotected steel provides satisfactory life. However, if the service dictates the need for a protective coating on steel, aluminum should be evaluated. For pressure vessels and tankage, aluminum has an enormous economic advantage over stainless steel and copper; and the recent introduction of new readily weldable high-strength aluminum-magnesium alloys has made aluminum even more attractive.

The strongest of these alloys, alloy 5456, has an as-welded tensile strength of 42,000 psi. A wide range of aluminum alloys is covered in both Section VIII of the ASME Code for Unfired Pressure Vessels and API Std. 12G: Specification for Welded Aluminum-Alloy Storage Tanks.

Aluminum lease-tank roofs have been in continuous service handling sour crude in western Texas since the early 1930's. Aluminum top rings have been used also to enclose the entire vapor zone with aluminum, and most tank manufacturers can provide such combination steel and aluminum construction. The idea of an all-aluminum lease tank is a fascinating one and considerable study has been given to this possibility.

One manufacturer has quoted on 500-bbl aluminum lease tanks at a price 15% higher than galvanized steel for bare aluminum or 19% higher for alclad aluminum. Longer life, coupled with the complete lack of maintenance, may make the all-aluminum lease tank an economical application. There is considerable research activity in an effort to develop new claddings which will improve aluminum's resistance to the pitting type of corrosion and enhance its suitability for this type of exposure.

Several all-aluminum lease tanks are in the service of the oil and gas secti of Alcoa's Raw Materials Division. T oldest of these tanks have been in se ice at St. Martinville, La. for over t years and are in excellent condition.

Distribution of Refined Product

Aluminum alloys are ideal for ma taining the quality of refined petrole products in storage or handling. Duri World War II, 2,500 aircraft refue trucks with aluminum tanks were s plied to the Army and Navy; and ma are still being built for peace-time se ice. In addition to the fact that a minum tankage does not contribute the formation of gum in gasoline, a minum offers greater economy for fuelers. Approximately 10% more p load can be carried in an all-alumin refueler for the same operating c experienced with steel units.

An allied application is the use aluminum pipe for handling jet a high-octane aircraft fuels in airport fueling systems. Here, again, alumin is desirable because it will not c taminate the filtered fuel. At least installations of aluminum pipe fr the final filter to the hydrant are know

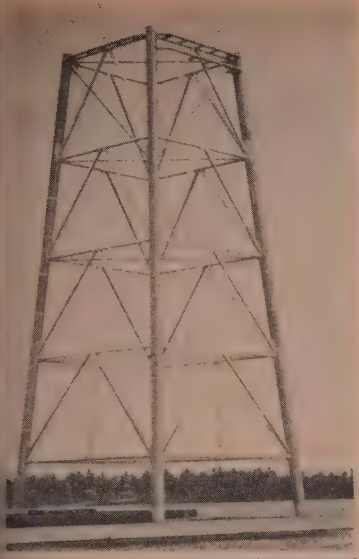
A Kansas City, Mo., manufacturi company now produces 33-½-lb, 43- lb, and 100-lb capacity aluminum l uefied petroleum gas cylinders. T weight of these cylinders is about tw thirds of that of low-alloy steel cylind of the same capacity, and since su cylinders are handled manually, t lighter weight is important. ICC Spec cation 4E covers welded aluminum c inders.

Aluminum has even found its w into a line of cast-aluminum comm cial gas meters. A common size wh operates at 100 psi and is rated at 1,0 cu ft per hour weighs 80 pounds aluminum and 340 pounds in cast ir Lighter weight is the major factor aluminum's favor, since gas meters m be serviced in awkward locations; t the lack of external maintenance is important feature also.

Lake Maracaibo, Venezuela

Lake Maracaibo, Venezuela, with fantastic amount of oil and gas prod tion, offers a large potential market aluminum. Although Lake Maraca water is unusually aggressive to st it has been found to have little ef on aluminum alloys. Interest was it ated in 1955 when the Creole Petrole Corp. installed an 800-ft length o in. Schedule 40 aluminum pipe in lake to determine aluminum's s ability. The line was inspected in 19 and, on the basis of its condition, Cr has installed 20 miles of alumi crude-oil gathering lines in the l

The peculiar nature of Lake M caibo water has resulted in the us



luminum towers such as this are used acket steel supports for oil well drill- rigs as protection against corrosive er of Lake Maracaibo, Venezuela.

ninum jackets for drilling plat- ns (MM, July '58). Fig. 3 is a view typical aluminum jacket nearly 100 in height. About 80,000 lbs of ninum are used in the fabrication ach of these. The jackets are barged he chosen sites and placed upright the lake bottom. Steel pilings are en through the corner posts, and the ulus filled with concrete grout. A ling or production platform is then ted on top.

his entire operation can be com- ed in from 3 to 5 days, whereas ventional platforms require 2 to 3 ks for construction. If desired, the minum jackets can be moved rela- ly easily It is reported that one minum structure has already been ved and that this mobility resulted a substantial saving to the operator.

e Future

o other metal industry has ever ex- ienced the rate of growth mani- ed by aluminum in the past 20 rs. When domestic aluminum smelt- facilities presently under construc- are completed, the total domestic acity will be 13 times that in ex- nce before World War II. In com- ison, the domestic steel industry has than twice the capacity it had in 9.

luminum is destined to find more in nearly every sector of our indus- l scene, and the petroleum industry no exception. For applications in ich aluminum is economical in its sent forms, it is being promoted; ere it is not economical, new products l manufacturing techniques are being veloped in attempts to make it so.

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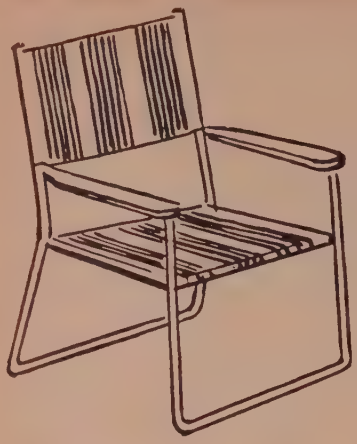

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NEW TUBING ALLOY

Square, octagonal, triangular, and other tube shapes can be extruded in new Alcan Tube-Alloy, and then be heat treated to strength levels needed for furniture.

A NEW extrusion alloy developed expressly for use in furniture tubing is now being marketed in the U. S. by Aluminium Limited Sales, Inc., New York 20, the American sales subsidiary of Aluminium Limited.

Called Alcan Tube-Alloy, the new material is said to make it possible to extrude aluminum tubing easily and economically in an almost limitless variety of shapes—square, triangular, octagonal, and even asymmetrical. What's more, the tubing can then be heat treated to strength levels equalling those of extruded and drawn tubing in other aluminum furniture tube alloys.

In other words, according to the company, the strength and other favorable properties of drawn round tubing can now be realized in special tube shapes —and at economical cost. This should give furniture designers greater latitude in achieving more salesworthy styles.

Developed through research and experience in Aluminium Limited's subsidiary companies in Europe and Canada, Alcan Tube-Alloy is a member of the magnesium silicide group of aluminum alloys. It is heat treatable, and is said to develop substantially higher strength than extruded 6063 (Alcan 50S), which is commonly used in furniture.

It is also less expensive and exhibits better extrudability than alloy 6061, a company report indicated. Although it can be cold drawn, it is usually extruded to size, thus eliminating c operation. When extruded in accorda with recommended practice, it takes a fine grained structure which perm bending without formation of "oran peel." Normal polishing and buff operations are said to give a good s face finish to tubing made of Alc Tube-Alloy.

Composition limits of the alloy are:

Element	Per cent Max.	Min
magnesium	0.70	0.4
manganese	0.10	
silicon	1.0	0.6
copper	0.10	
iron	0.60	
titanium	0.10	
each other	0.05	
total, others	0.15	
aluminum	remainder	

Alcan Tube-Alloy can be extruded a speed approaching that used for 60 and with an equivalent as-extruded s face finish on many types of shap Hollow shapes in the alloy can be truded with porthole dies.

Table 1—Mechanical Properties of Alcan Tube-Alloy and Two Other Alloys Used for Furniture Tubing

	Typical Values (minimum in brackets) Tensile Strength 1000 psi	Yield Strength 1000 psi	Elongation % in 2 in.(1)
Alcan Tube-Alloy-T6 (2)	42 (38)	38 (34)	16 (12)
Alcan Tube-Alloy-T6A (2)	40 (36)	32 (28)	22 (18)
Alcan 50S-T8D	41 (37)	39 (34)	11 (7)
AA6063-T832	42 (38)	39 (35)	12 (5)

NOTE: (1) Up to 2 in. O.D. where tube is pulled in full section.
(2) Water quenched at the die. Formal solution heat treatment may result in a slight decrease in mechanical strength.

Table 2—Recommended Radii for Draw Bending Alcan Tube-Alloy

Nominal Outside Diameter inches	Nominal Wall Thickness inches(1)	Minimum Bend Radius with mandrel inches	without mandrel inches
¾	0.049	2	2
⅞	0.042	2½	3
1	0.049	2½	3

(1) Allowable deviation at any point from nominal wall thickness ± 0.008-0.007 inch.

Use Homogenized Billet

Although the company recommer that homogenized ingot be used, the sired metallurgical structure can achieved in non-homogenized ingot soaking it at 1020°-1040°F for four hou The recommended extrusion tempe ture range is 875°-930°F, and contain temperature should be 840°F.

The new alloy responds well to wa quenching at the die, but solution h treating at 968°F (±5°) may be s stituted for this treatment. Ageing shapes for six hours at 338°F (± will produce a T6 temper. For a T temper, age it for six hours at 31 (±5°).

The mechanical properties produ

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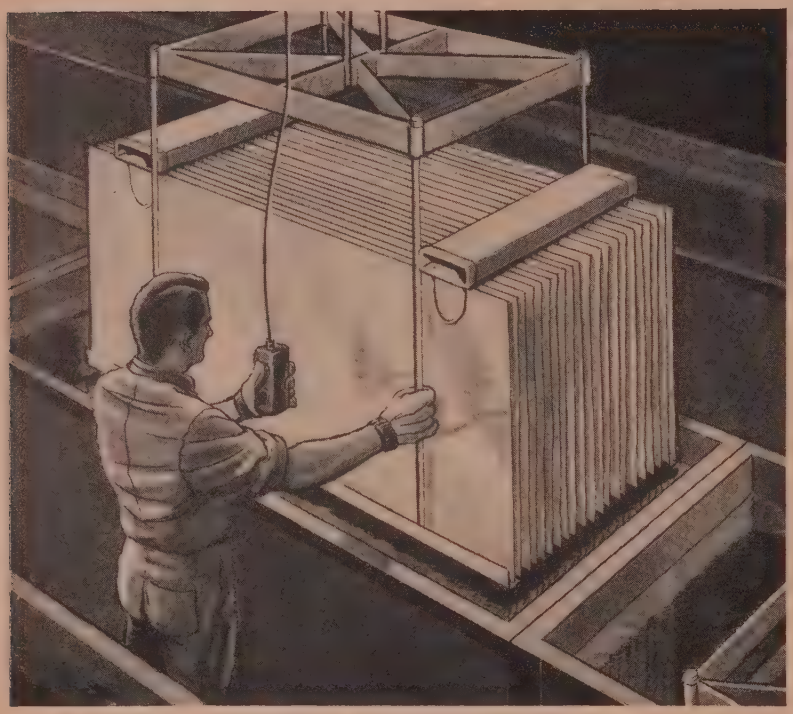

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by these treatments are shown in Ta 1, which also gives the properties Alcan 50S-T8D and alloy 6063-T8 Note that the strength levels achie in Alcan Tube-Alloy are compara with those of the other alloys, while elongation is significantly higher.

This greater formability is of spe value in the production of alumin furniture. The recommended radii 90° bends in three common sizes furniture tube are shown in Table (These radii are for draw bendi In crush bending, the new alloy sponds in much the same manner Alcan 50S-T8D and alloy 6063.

As with other alloys, the minim bend radii depend upon tool des and adjustment. A square bend n be carried out in the T6A temper conjunction with a preforming op tion, but this places a severe formabi requirement on the tubing.

Tubing in the T6 temper and w wall thicknesses up to 0.049-inch r be flattened without cracking until minimum inside dimension reaches times the wall thickness. In the T temper, tubing of similar thickness r be flattened without cracking so that inside surfaces are in contact.

As mentioned above, the as-extru finish of tubing in the new alloy equivalent to that normally obtai with other alloys used for furniture ing. The fine grain metallurgical st ture produced when shapes are extru from homogenized billet elimin "orange peel" when the tubing is b

When Finishing It . . .

The company reports that polis and buffing operations on the new a impart a surface brightness equal to on other furniture tube alloys, and b new product does not exhibit the t ency to "open grain" associated some drawn tubing.

The new alloy may be anodized in normal manner, and takes on an dized appearance similar to that of dized Alcan 50S. With increasing o film thickness, however, the color comes somewhat grayer than tha Alcan 50S and 6063.

The weather resistance of A Tube-Alloy equals that of the furniture tube alloys. The materi not susceptible to stress corrosion, it should not be subjected to sea exposure since deep pitting may velop.

Although it was developed specif for furniture applications, other may be found for Alcan Tube-A The company emphasizes, however it should not be used in structur plications requiring high fatigue impact properties.

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PRIMARY PRODUCERS PUT PRESSURE BEHIND ALUMINUM CONDUIT SALES

Kaiser forecasts aluminum's capture of 75% of electric conduit market by 1965; slashes prices, boosts marketin efforts to make its prediction come true. Other produce strive to keep pace; spur conduit output, merchandisin Market now consumes 400,000 tons of steel conduit annuall

By *H. K. Darby, Associate Editor*

ALUMINUM conduit is rapidly outgrowing its reputation as a "specialty item" in the electrical field. It had been a substantial profit maker for a few electrical wholesalers as far back as 1955, but was no pot of gold for the primary aluminum producers; total volume was so small it hardly merited a line in their annual statistics.

The picture is now being reversed. A series of price reductions by two aluminum producers has brought the price of aluminum conduit below that of steel. Intensified promotion on the part of three producers has breached the resistance of the great majority of electrical wholesalers (the only group that sells conduit) and contractors. The combination of low price and intensified sales effort is beginning to give steel its first real competition.

Wholesalers who had cashed in on aluminum conduit in years past are resigned today to slimmer profit margins. On the other hand, many more wholesalers are now stocking aluminum and beginning to move large amounts of metal.

400,000 Tons in Steel

Aluminum conduit sales are still a mere sliver of the total conduit market, which has been estimated at 800 million pounds annually in steel. But with so much in aluminum's favor, there is little doubt that steel's years as the leading conduit material are numbered. Kaiser Aluminum estimates that the light metal will have 75% of the market by 1965.

Many factors have retarded aluminum's progress as a conduit material, the major one probably being price.

■ *Aluminum conduit installation in a large chemical plant. Alcoa sold large installations in this and other fields over a period of 30 years. Such installations are still on the job.*

Alcoa's awareness of aluminum's wor in conduit dates back to before 1932, t year the company secured Underwrite approval on the product. Since th the company has filled isolated condu orders from time to time, and sold a fe large installations—which, after 25 yea are incontrovertible proof that alun num has what it takes. (One early j was for part of the electrical system the Wrigley Building in Chicago, in t late 20's.)

This situation changed dramatica in 1955, when Hawkins Electric C Chicago, a distributor of electrical su plies, started to sell aluminum condu as a premium product having defin advantages over steel.

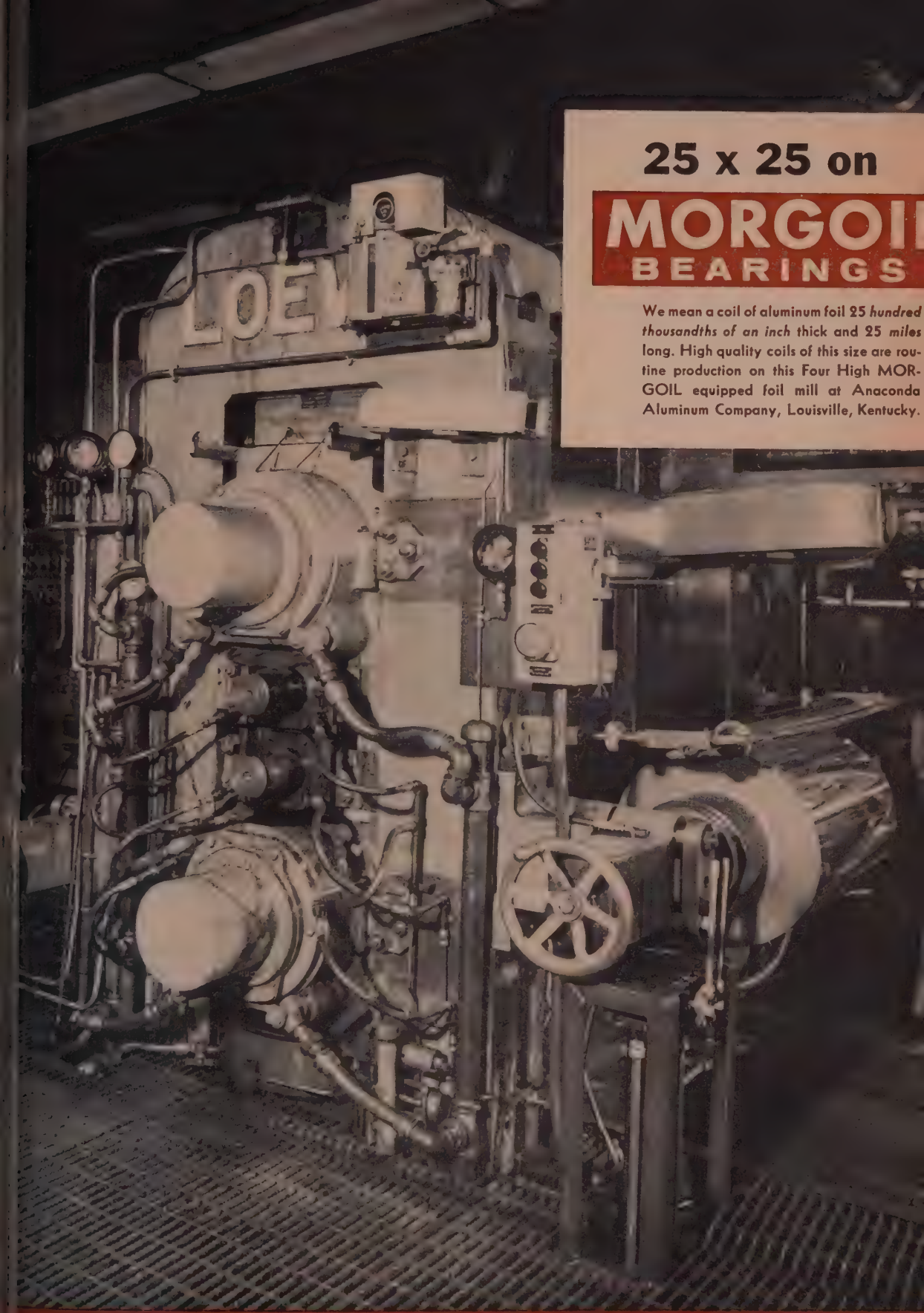
"For years everybody had been t ing to sell all the steel conduit th could," recalls Rollwood R. Hill, pr dent of Hawkins. "There was no pr in the thing because prices were degraded. The more I thought ab aluminum, the more certain I beca that it would be more profitable for to sell a product that wouldn't rust corrode—a material that would s cleaner, longer. It would cost more, it would be a worthwhile challenge."

Hill also reasoned that alumin could be sold on the basis of lo installation costs and little or no mai nance. He called on Alcoa in Pittsbu where he found himself in the surp ing position of having to plead alu num's case as a saleable conduit prod One exchange stands out in H recollection of his three-hour visit w an Alcoa executive.

Alcoa Man: "How can you sell alu num conduit when *we* haven't b able to?"

Hill: "You just don't know how sell it!"

Alcoa had sold some aluminum duit during the steel shortage imm ately after World War II. "—But it se as though it was sold as a poor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We mean a coil of aluminum foil 25 *hundred thousandths of an inch* thick and 25 *miles* long. High quality coils of this size are routine production on this Four High MORGOIL equipped foil mill at Anaconda Aluminum Company, Louisville, Kentucky.
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ROLLING MILLS • MORGOIL BEARINGS • GAS PRODUCERS
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■ *Aluminum conduit gives no trouble in cutting. Sizes 1¼-inch and smaller should be cut with a hacksaw as a wheel cutter tends to reduce the diameter.*

stitute for steel, rather than because of its own special advantages," Hill said.

But Hill got Alcoa's good wishes and the assurance that he could have all the aluminum conduit he could sell. He gave Jack Miller the task of promoting aluminum conduit, and Miller soon found that most electrical contractors were unimpressed by aluminum's advantages, particularly when it was priced about 50% higher than steel.

Hill and Miller ferreted out the conduit applications where aluminum's advantages were most obvious. Chemical and paper manufacturing plants and sewage treatment plants were prime targets because of their corrosive atmospheres. Food plants were interested in the bright, sanitary appearance of aluminum.

They compiled a list of contractors, made extensive mailings, and followed them up with calls by salesmen. The orders began to come in with increasing frequency.

"When we saw that certain industries were willing to pay over 50% more for aluminum's advantages, we knew we had something," Hill said. "Our customers were primarily those who had enough corrosion trouble to be willing to pay more for a material that would lick this problem.

"Even in construction where corrosion wasn't the problem, contractors began to listen to the story of substantial savings through reduced labor costs."

Visking Corp., Chicago, was a case in point. This outfit listened to the aluminum conduit story and influenced the contractor. And the contractor's experience with the light metal enabled him to bid successfully on Chicago's new Convention Center, now under construction, and save 30% on his conduit installation costs.

"Some contractors even claim that aluminum saves 40% on labor," Hill said. "One of the easiest ways to sell aluminum conduit is to let the contractor heft it."

But not all electrical contractors are falling right and left for aluminum's sound qualities, Hill cautioned.

"There's a large group of die-hards who've been using steel for 25 years and don't care to change," he said.

Contractors are the special sales target of men like Rolly Hill. His company is one of around 5500 electrical wholesalers who, according to the National Electrical Contractors Association,

Labor Units Comparison for Galvanized and Aluminum

Units in green are for aluminum

O.D. In.	Ceiling Height 12′	16′	20′
	Man Hours		
1¼"	6.50	7.80	11.50
	4.90	5.90	8.50
1½"	8.00	9.60	13.50
	5.40	6.50	9.00
2"	11.00	13.20	16.50
	7.00	8.50	10.50
2½"	15.50	18.30	22.00
	9.80	11.50	14.00
3"	18.50	22.00	26.00
	11.70	14.00	16.50
3½"	22.00	26.00	30.00
	12.80	16.50	19.00
4"	30.00	36.00	40.00
	17.50	21.00	23.50
5"	41.00	49.00	54.00
	24.00	29.00	31.50
6"	53.00	63.00	68.00
	31.00	37.00	40.00

National Electrical Contractors Association data.

■ *Installing aluminum conduit for service and feeder work cuts manhours. The larger the size, the greater the advantage over steel conduit work.*

"simply must sell conduit." This group is the only link between conduit manufacturers and the installers.

In January 1958, Alcoa pared its aluminum conduit price to a level that was still about 20% above that of steel. Due to its ease of handling, however, aluminum could usually be installed more cheaply if diameters larger than 1½ inch were involved.

Kaiser Aluminum entered the market late in '58 with a line of conduit, couplings and 90° elbows approved by Underwriters. Then last February 11th, Kaiser trimmed prices to 2 to 3% above steel conduit. With its installation savings aluminum conduit became the most economical in nearly every case.

Then, last April 27th, Kaiser cut the price again—this time to about 8 below the initial cost of steel condu Other aluminum conduit makers had choice but to follow suit.

Kaiser contends that it can compe profitably with steel conduit because has invested heavily in "efficient, aut matic, integrated processing equipme for converting extruded tube in finished conduit."

Even without automatic operatio aluminum conduit can be produce faster than the steel variety. The latt begins to take shape when steel shee are sheared into long ribbons, heate and roll formed into tubular shap which are then resistance butt-welde cooled and stretched. Rough weld fla is then scarfed inside and out.

Cutting to length, galvanizing, threa ing and rethreading are other operatio required, sequence depending whether or not galvanizing is done co tinuously. Finally, the inside must enameled to prevent corrosion.

Volume production is the key, an Kaiser's Dolton, Ill. plant (Chicag area) is devoted almost exclusively conduit production (it still produc other shapes). The company's Hal thorpe, Md. plant devotes some of i time to conduit work. Location of the two plants gives Kaiser a decided ma keting advantage.

Alcoa currently produces conduit its Lafayette, Ind., works, and at t Torrance, Calif. plant of its Ron Cable Division. Neither makes condu exclusively. Reynolds Metals Co. pr duces conduit at its Phoenix, Ariz., an Richmond, Va. plants.

Hazelwood Engineering & Equipmer Inc., Hazelwood, Mo., is said to ha been the first independent extruder produce aluminum conduit. The firm conduit brochure lists standard siz up to 5 inch diameter, though the 6-in

■ *Wire and cable can be pulled throu aluminum conduit with relative ease to interior coating with special lubrica*

KAISER ALUMINUM

ALUMINEWS

A page of products and availabilities for those interested in metalworking. If you would like detailed literature on each subject, mail the coupon below.

. *Bright finish welding wire*

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t's available in a complete line of ding rods and electrodes in a broad ge of alloys—including new all-pur- e alloy 5183, developed specifically welding the high strength mag- ium-bearing aluminum alloys 5083 5086.

The consistent high quality of King nd bright finish welding electrodes l rods is achieved by rigid produc- n and inspection controls, including liographic and destructive testing of ual welds.

aiser INert Gas

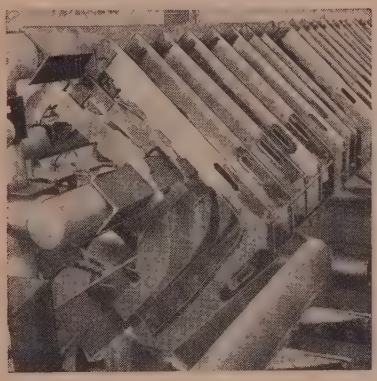
. *Wider sheet, heavier plate*

e production of wider sheet, heavier ite and bigger coils is made possible Kaiser Aluminum's 168-inch, 4-hi reversing hot mill and 100-inch, 5-stand continuous mill at Ravenswood, W. Va.

Sheet and plate in width to a maximum of 144 inches and finished coils weighing up to 8500 pounds are included within final availabilities. Foil in gauges as light as 0.00025 inches and widths to 66 inches is also in production.

ant 10,000 lb. aluminum ingot being lifted from rect chill casting station at Kaiser Aluminum's venswood plant. Next stop—the hot line!

3. *Rolled tooling plate*



A typical large aircraft assembly fixture. Use of aluminum tooling plate provides greater portability and simpler set-up without need for overhead cranes or lift trucks.

Produced for today's tool design requirements, Kaiser Aluminum's Rolled Tooling Plate opens up exciting new avenues to cost cutting.

Reasons: (1) It's machined both sides to provide a flat base for accurate layout and measuring; (2) it offers a finer grain structure, freedom from porosity, higher strength, finer finish and better welding characteristics; (3) it weighs only one-third as much as steel, handles easily without the need for expensive positioning equipment.

Among the growing list of industries profiting from Kaiser Aluminum Tooling Plate: aircraft, electronics, appliance, automotive, plastics, foundry and marine.

4. *High strength yet ductile casting alloys*

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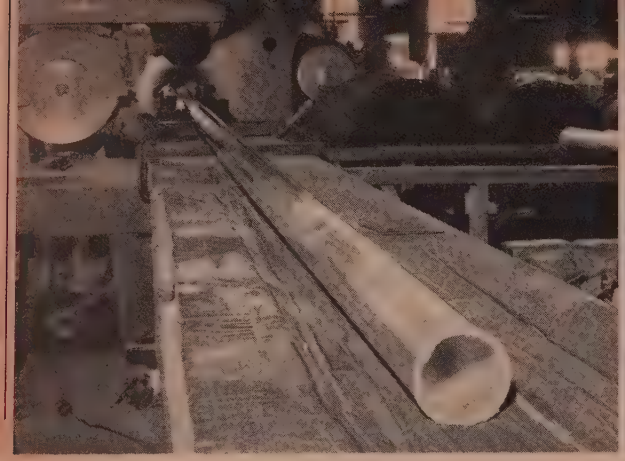

■ *Kaiser Aluminum attributes its ability to drastically reduce conduit prices to its automatic processing lines which economically turn extruded tube into finished, packaged conduit. At left, 3-inch tube is emerging from press at the company's Dolton, Ill. plant. Stretching and cutting to 10-foot lengths follow, after which automatic threading (right), interior coating, coupling attachment and packaging are done. Kaiser has two conduit processing lines at Dolton.*

size can probably be produced. Michael Flynn Mfg. Co., Philadelphia, and New Jersey Aluminum Extrusions Co., Inc., New Brunswick, N. J., are also listed.

Olin Aluminum has an arrangement with Pittsburgh Standard Conduit Co. to supply aluminum tube blooms from which Pittsburgh Standard will produce drawn conduit. Olin stresses its intention of remaining a supplier of the basic metal.

How Much? Who Knows?

Production figures are not disclosed, but it seems obvious that the three leading domestic producers have boosted production and sales radically in the past few months. Reynolds Metals, for example, reports that its sales in the third quarter of this year were almost twice those of the second quarter, and the second quarter sales were 10 times greater than the first quarter. Kaiser and Alcoa quickly assumed the burden of promoting aluminum conduit, while Reynolds is getting up a full head of steam in the same direction. And for good reason, too; it would be difficult to find a better application for aluminum.

All aluminum conduit is made in the standard Iron Pipe Sizes: ½, ¾, 1, 1¼, 2, 2½, 3, 3½, 4 and 5 inch sizes. Although 6 inch conduit is considered standard, it is not usually stocked. The only length made is 10-foot. Thinwall aluminum conduit is made in four sizes by drawing from the heavier extruded stock, but it can't qualify for Underwriters Laboratories approval and rarely, if ever, meets local code requirements. Rigid aluminum conduit is seeing most of the action. Neither Reynolds nor Kaiser lists thinwall; Alcoa does.

Most conduit fittings and accessories are die, sand or permanent mold cast—usually by independent companies who have tooled up for this work. Elbows and couplings, however, are made by the primary producers.

Galvanized steel fittings are often used with aluminum conduit. Where aluminum fittings are used, they are usually coated with a tar paint because the copper-bearing casting alloys are susceptible to electrolytic action.

"The factor that makes aluminum conduit so attractive to contractors is a big saving in installation cost—up to 40% on the larger sizes," a spokesman for the National Electrical Contractors Association said. "That is due to the weight factor. Our members want the code authorities to approve aluminum conduit in 20-foot lengths, thus increasing this margin of saving."

■ *This contractor's employee is holding aloft a 10-foot length of 3½-inch aluminum conduit—weight, about 28 pounds. At 83 pounds per comparable steel length, it wouldn't be so easy.*

The figures tell the story: A standa 10-foot length of 4-inch aluminum co duit weighs 34 pounds with its coupli attached, while the same length a size in steel weighs over 98 pounds. Th means that on the large commercial a industrial jobs, installation cost is su stantially lower with aluminum becau one man can do the work of two.

Easier Cutting, Bending

In fact, from shipment, through u loading to actual installation, the j goes faster with fewer manhours. Whe overhead installations are involve aluminum is even more economical.

Installation techniques and tools a the same for aluminum as for ste Because aluminum is softer, howeve manual hack saw cutting, even on 4-in conduit, is fast. Within the limits various building codes, aluminum quires fewer supports. The same threa ing equipment and cutting oil can used and, according to the NECA, t dies will last 4 to 10 times longer.

The association points out that alum num's softness makes threads mo vulnerable to damage, indicating th the light weight of the metal can cau the conduit to throw, damaging t threads. A wide range of anti-seize co pounds solve the thread seizing proble

The same bending tools can be us for aluminum, but lighter weight to have been designed.

A recent comparison of labor un for aluminum and galvanized condu is shown on page 80.

A contractor rarely has any inter in aluminum conduit beyond what light weight can save him in instal tion costs. The product's other desira properties appeal to the companies which it must work. Corrosion resista is the outstanding property from standpoint of the user.

(*Continued on page 84*)

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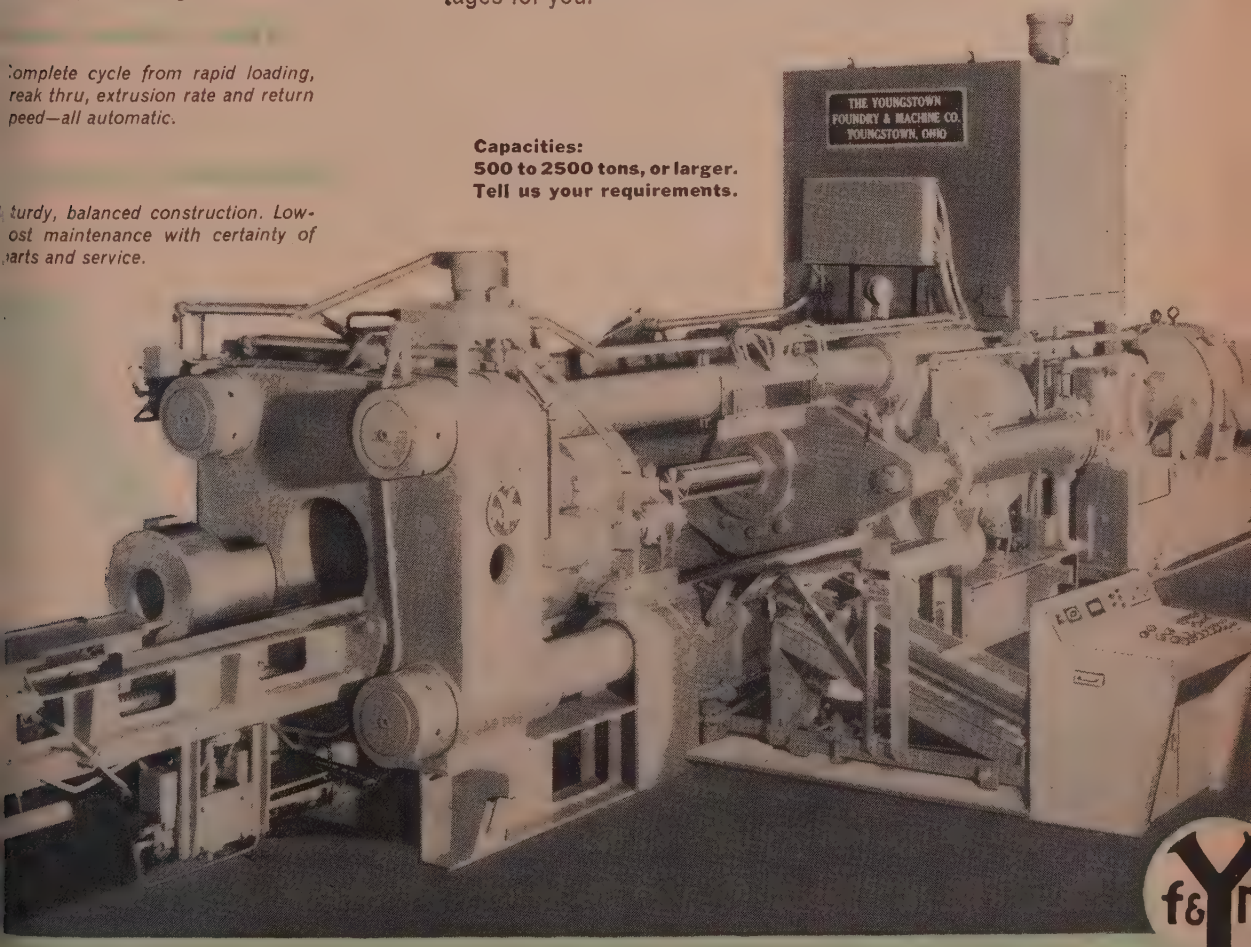

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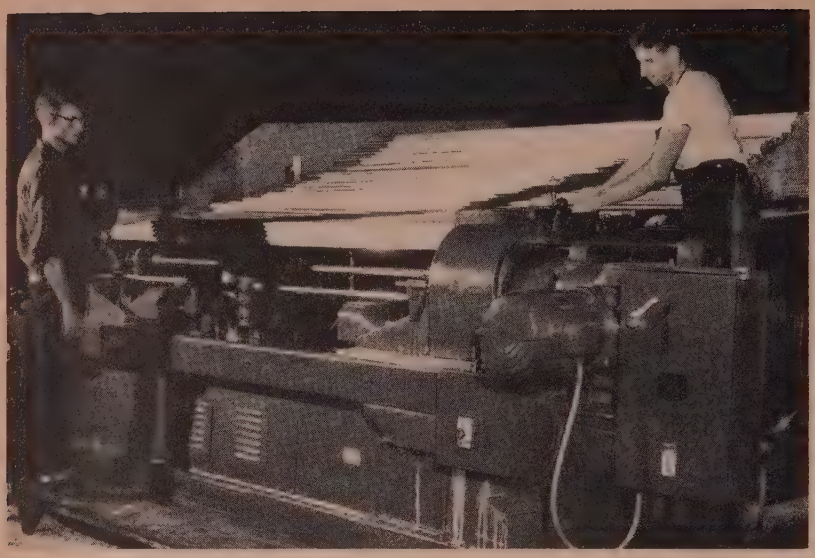

■ *Lengths of conduit are fed into this machine at Reynolds Metals Co.'s Richmond, Va. extrusion plant, for threading of ends before final packaging and shipping to wholesalers. Operations at this plant are highly automated.*

Aluminum's natural oxide coating enables it to stand up well in most industrial atmospheres, particularly the acid variety. It isn't necessary to paint aluminum, but steel conduit requires periodic protective coating.

Although some contractors claim that aluminum should not be embedded in concrete without a protective coating, tests have proved that bare aluminum conduit *can* be so placed—above or below grade—without harmful results.

Some contractors contend that aluminum conduit, embedded in concrete that is cured under continuously wet conditions, might be subjected to harmful corrosive attack. Tests have proved that aluminum is hardly affected by this.

Another claim is that galvanic corrosion occurs when aluminum conduit is laid in contact with steel reinforcing rods in concrete. Tests have disproved these claims.

An important requirement in burying aluminum (or steel) conduit in concrete is to seal it off completely from moisture. To lay it at ground level with the concrete surrounding the conduit on three sides only would expose it to the corrosive action of soil, which is often highly acid or alkaline.

Aluminum conduit is kept off ground level by blocking on concrete or stone blocks. Wooden blocks should not be used because eventual rotting opens the way to moisture and corrosion.

Unfavorable opinions about aluminum's behavior in concrete are probably caused by the presence of excessive calcium chloride in some concrete mixtures. This salt is added to accelerate curing in winter, but it has a harmful effect on both aluminum and steel.

While bare aluminum can usually be buried in the ground without adverse effect, general practice is to coat aluminum (or steel) with a tar compound as protection against highly corrosive attack by some soils.

Aluminum is non-magnetic, so there is less voltage drop in the conductor through hysteresis loss. This means that a user of aluminum conduit gets full voltage for a given conduit size. In certain borderline cases it may enable the user to avoid going to the next conduit size in order to obtain his current requirements.

Also, aluminum's non-magnetic property rules out induction heating of the conduit. This allows each conductor of a single phase or polyphase circuit to be in its own conduit, thereby avoiding ringing out individual cables. Having the multiple conductors of one phase in one conduit also eliminates training and crossing over of the conductors when connecting switchgear and transformers.

Cable faults can seriously damage a transmission system where the conductors of multiple phases are carried in one conduit; less damage would be caused by cable faults occurring in conduit carrying similar phase conductors. Aluminum installations are safer because the light metal is about five times more conductive than steel and so gives less resistance to ground fault current. This produces more fault current for breaker operation.

Giving It Away?

"I think we're on the right track, reducing the price of aluminum conduit as we have," a Kaiser spokesman said recently. He feels that his company's primary objective is to move metal; that the wholesalers' reaction to greatly i duced prices is of little concern of t primary aluminum companies.

This is the viewpoint of a compa that says it's making a profit on condu despite rock-bottom prices. But a rep sentative of another producer cann believe that Kaiser isn't "giving t stuff away."

"In the beginning, conduit look like a very good item for the ind pendent extruder," said L. W. McNa president of Hazelwood Engineering Equipment. "But Kaiser cut prices som what under steel, and created a situati that, to say the least, is very margin as far as making a profit is concerne Since the product has so many adva tages over steel, it is hard to understa why they sell it at a cheaper price."

Wholesalers who have been handli aluminum for years don't appreci Kaiser's drastic action, either.

"We're not only mystified as to w they chopped the price down so low one Reynolds customer complaine "but also puzzled over what we consid a very loose Kaiser distributor poli The Chicago area is crawling wi Kaiser distributors."

This seems unlikely. For instance, t combination of Alcoa distributors p those of its Rome Cable Division mak Kaiser and Alcoa even-Steven in m areas. Kaiser counters that it holds distributors strictly to 3000 poun stock, a rule which it claims is r generally insisted upon by other c duit manufacturers.

At the same time, Reynolds hasn't be laggard in building its electrical d tributor network. They've added o

■ *Aluminum conduit bends with e Both hand and power bending equipm is used, the latter for the larger dia ters.*

Here's how Olin Aluminum can help you get more extrusions for your dollar. We make aluminum — so we're thoroughly acquainted with the properties of all extrusion alloys. We're also experts in extrusion design and the related art of die-making. Combining this overall knowledge, we can help you achieve extrusions that use a minimum of metal with a maximum of efficiency.

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■ *Kaiser Aluminum's five conduit demonstration vans were lined up recently for a family portrait in Birmingham during a week-long school for the demonstration crews. Each van is assigned to a region in the U. S.*

100 stocks for Reynolds rigid electrical conduit since May 1st, and now have over 200 distributors serving all major conduit-using areas across the country.

These sources include local independents and such chain houses as General Electric Supply, Westinghouse Electric Supply, and Graybar Electric. These national companies stock conduit products of other manufacturers. Reynolds reports that it has a goal of at least 300 distributorships. Twenty, incidentally, are already established in the Chicago area.

The net result, according to the Reynolds customers, is that wholesalers' salesmen have less incentive to make up bids on larger installations. There are too many fingers in the pie. If a contractor wants steel conduit, the wholesaler is just as likely to go along with him.

"These days," declares Rolly Hill, "stocking aluminum with the distributor doesn't mean he will promote it."

Hill may be right, but it is apparent that the three leading primary producers have seized the promotion reins with both hands.

The Show's on the Road

It is generally agreed that Kaiser Aluminum has promoted aluminum conduit more aggressively than any other producer during the past 12 months. Using every medium, the company has delivered its pitch to distributors, electrical contractors and engineers, utilities, purchasing agents—even industrial management consultants.

"In short," a Kaiser man said, "we're trying to reach everyone in a position to buy or influence the purchase of conduit."

Kaiser is leaving nothing to chance in its effort to convince users and potential users of aluminum conduit that the Kaiser product is the best for their purposes. Five Kaiser demonstration vans are on the road, making scheduled plant calls on a national basis. The trucks are equipped with all the tools and supplies needed to cut, bend and thread aluminum rigid conduit in all 12 standard sizes.

Displays inside the trucks feature the conduit fittings and accessories of well-known companies such as Thomas & Betts, Burndy, Crouse Hinds and Killark. Other displays promote aluminum building wire terminals and connectors, and samples of electrical products.

The demonstration crews who carry the word to electrical contractors, distributors, utilities, plant electricians, and other special groups, were trained in a special school in Birmingham, Ala., which turned them into "specialists who are qualified to give complete instructions on the best installation procedures for aluminum rigid conduit."

"It is vital at this point to make available practical information about the product," explained J. Carl Ferguson, general sales manager of the Electrical Conductor Division.

Presumably, the demonstration vans are the final clincher to Kaiser's participation in trade shows, conventions, distributor meetings; advertising in the leading electrical trade magazines; personal calls on contractors, distributors, engineers; and mass distribution of brochures and other printed matter.

Alcoa is doing pretty much the same thing, with perhaps somewhat less emphasis on personal demonstrations.

Reynolds' slow start in the race for conduit business is surprising in view of their fast-breaking moves in other fields.

In spite of this, Reynolds has a p
motion program directed toward wh
salers in some 200 cities. Seminars
held in a major industrial center wh
a wholesaler will invite many types
contractors, city inspectors, plant e
neers, and maintenance executives
the people with whom the contrac
deals—even union officials."

At each seminar an electrical c
tractor puts on a demonstration of
minum conduit installation techniq
A Reynolds engineer is present to h
answer technical questions. Nine se
nars have been held so far; three m
were to be held this month.

A Reynolds man admitted that
company has sold virtually no cond
until this year, but added that
contest has only started and that
study is under way to determine the b
means of going after this market.

Based on limited knowledge of
manufacturers' operations, it is e
mated that slightly more than 2,000,
pounds of aluminum conduit are be
produced each month in 10 extrus
plants. Even this comparative tric
into an enormous market seems to h
the steel conduit manufacturers worri
as evidenced by their advertising.

Only in the past half-year have t
considered it necessary to claim t
"Steel Conduit Is Better," that it "
sists Corrosion," or that it offers
best protection against impact.

It isn't to be doubted that sou
promotion of a sound product w
put aluminum in front where it belon

■ *Pulling an order at a wholesale warehouse in Spokane, Wash. Elbo and couplings are made by the prima producers and independent extrude There was a time when electrical who salers promoted aluminum conduit tensely, even wrote specs for municipa ties. Primary producers are the promot now.*

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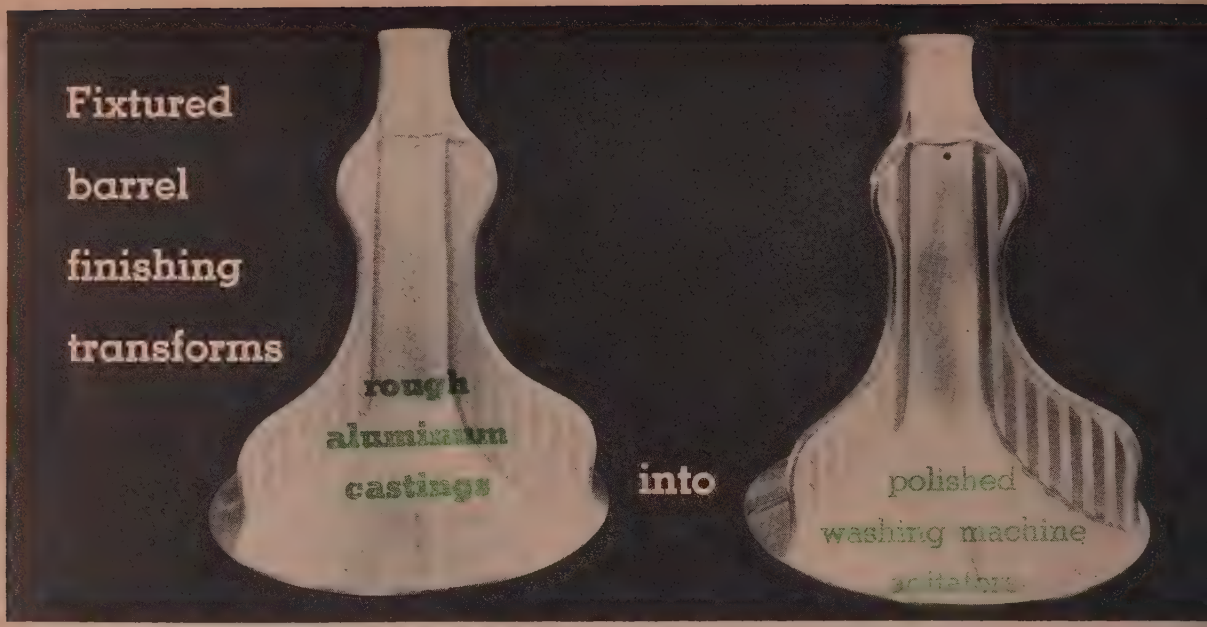


NEW barrel-finishing equipment that removes burrs and polishes large aluminum castings in a matter of minutes has recently improved finishing operations at the Fairfield Aluminum Casting Co., Fairfield, Iowa.

The equipment uses fixtures to hold cast washing machine agitators in place during the finishing process. The barrel finisher quickly removes all "fins" and imparts a smooth sheen to the castings.

"Fixture barrel finishing is saving a lot of time and labor and aiding our customers, too," George H. Hammon, superintendent of the Fairfield foundry, said. "Smoother agitator surfaces help prevent damage to clothes and fabrics, our customer reports, and the burnished agitators look better. Improved appearance helps close the sale."

Before fixture barrel equipment was installed, washing machine agitators were machine finished only. This slow process left many sharp edges that were impossible to remove in the machining operation. Much hand labor was required before shipping the casting.

After investigating various barrel-finishing techniques it appeared that the rough castings needed fixtures of some type to prevent the castings fro striking each other during the tumblin action. Standard barrel finishing meth ods permit castings to slide freely wit the finishing compounds and media.

Special fixtures to hold castings st tionary inside the drum barrel are new development. They are particular important when castings have shar contours, large areas, intricate shapes.

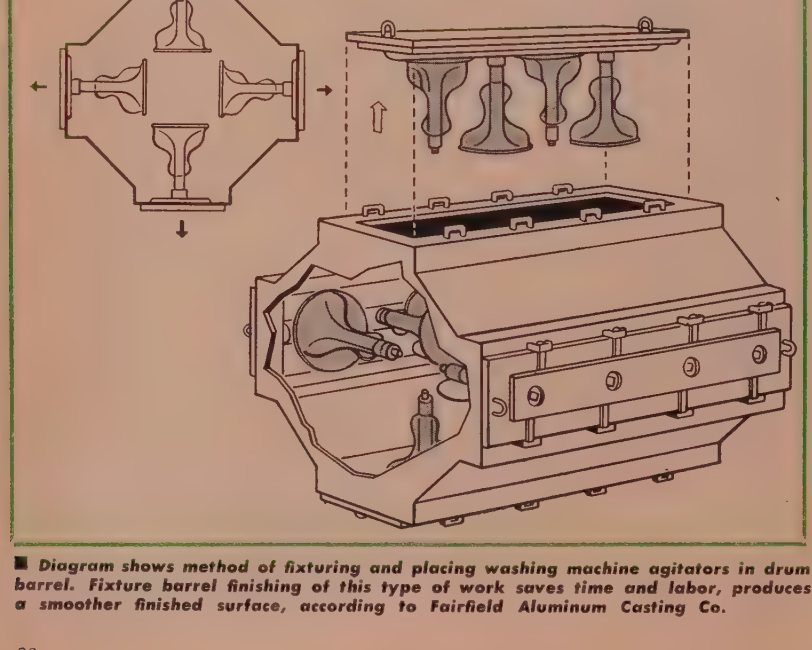
Many types of holding devices wer available for the Fairfield washing ma chine agitators. Holding bars wer selected as the device best suited fo keeping the washing machine agitato firmly in place yet permitting burnish ing compounds to reach all areas.

Right angle mounting on the barre doors was chosen to permit free flo of burnishing material and to facilitat handling. Door mounting makes simple to load and unload the agitator Speed in handling the castings was in creased by installing a monorail directl above the barrel finishing unit.

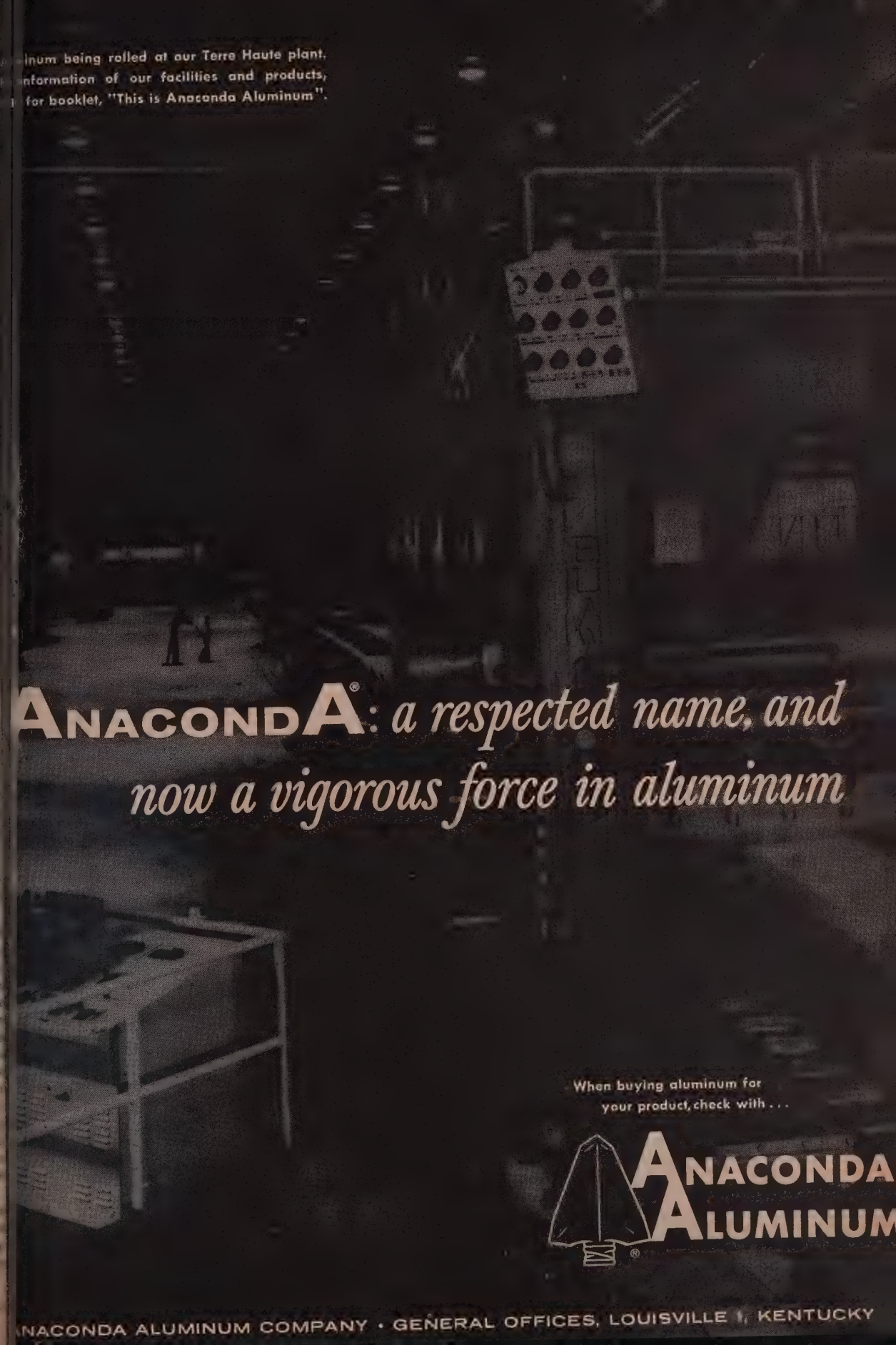
In order to increase the number o agitators processed, a four-door mode is used instead of the conventional one door type. This increases the wor load to 16 castings instead of nine. Fou washing machine agitators are fixed t each door on the fixture finishing drum Barrel finishing equipment used is tha of Almco Queen Products Division o King-Seeley Corp., Albert Lea, Minn

Burnishing and polishing is now relatively simple job. The barrel finish ing drum is first filled two-thirds ful with a solution composed of 3/16-in steel burnishing balls, two types o burnishing compounds, and water.

The 16 washing machine agitators ar locked in the door fixtures and the drum barrel revolves for 20 minutes at me dium speed, reversing direction ever



■ *Diagram shows method of fixturing and placing washing machine agitators in drum barrel. Fixture barrel finishing of this type of work saves time and labor, produces a smoother finished surface, according to Fairfield Aluminum Casting Co.*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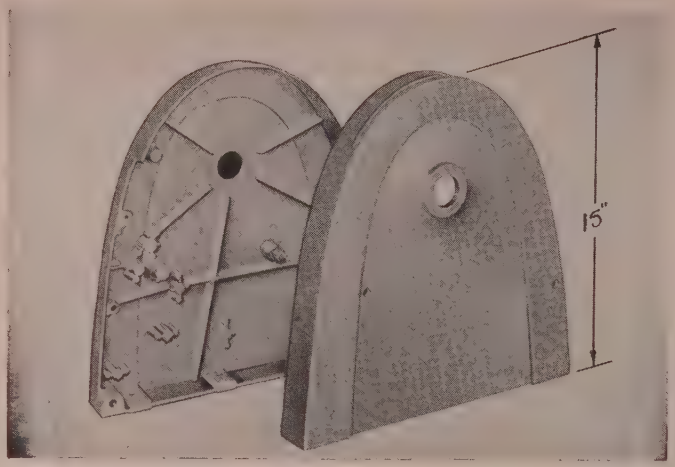

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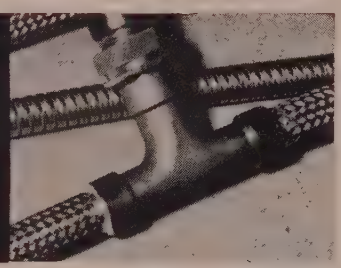
SOLDERING PROBLEM?

stainless to aluminum?

aluminum to copper?

cast iron to steel?



BOEING 707 Landing Gear Harness
Braided stainless steel wire and flexible conduit had to be joined to cast fittings. Brazing burned the fine wire. ALL-STATE had a special solder which solved the problem. (See #430, below.)

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#430 NO LEAD, NO ZINC or CADMIUM — develops tensile strengths of 10,000 to 28,000 psi on stainless and dissimilar metals. For soldering iron at a low 430°F.

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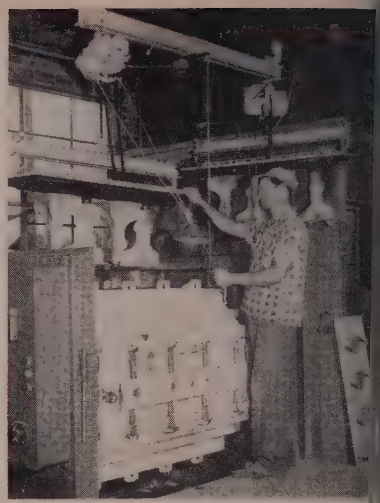

■ *An overhead monorail speeds up pr essing of the big castings in the Aln barrel finishing machine. Extra dr doors and fixtures permit setting up agitators for finishing while other w is in process.*

five minutes. This time interval sufficient to remove rough burrs a impart a high sheen to the castings.

Extra fixture doors make it possi to maintain an almost continuous fin ing of rough aluminum castings. Af the original 20-minute cycle, a door be removed every five minutes from barrel drum and a new set of f rough castings inserted. The ex finishing time received by some of castings brightens the sheen even mo

This continuous cycle of work p mits the finishing of 336 castings a d and produces high quality washing chine agitators that can be sent to customer without additional cleani The only time loss is the 45-secc interval between loading and unlc ing door fixtures. Flushing and charging the barrel with a new s tion is kept to the minimum since solution can be reused several times.

The drum barrel quickly conv for either loose or standard fixt finishing by removing the plates putting rubber plugs in the bolt ho

This permits various finishing op tions with a wide variety of abra chips, hardened steel shapes and fin ing compounds. The equipment efficiently deburr, grind, polish, burn reduce surface porosity, form radii, scale, and perform other functions.

In operation since 1946, Fairf Aluminum Casting Co. has six dep ments in addition to the barrel fin ing operation. The Iowa foundry as both sand and permanent mold fou ries, a coremaking section and melt g. trimming and shipping departmen

The facilities occupy 18,000 squ feet and produce lawn mower de government ordnance and aircraft ings, electrical conduit fittings.

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SHEET CRATING SIMPLIFIED FOR ALUMINUM DISTRIBUTORS

A UNIQUE crating jig on wheel being held out as the answe the warehouseman's prayer for a wa crate sheet securely, speedily and nomically.

Effective sheet crating has been a problem for aluminum and steel tributors that the National Associa of Aluminum Distributors launche survey in 1956 to learn requireme

The variety of sizes, gauges, tem and quantities was so great that distributors had a standard crating p tice.

In some instances, expensive ta made crates were built; in others, adequate packing materials were vaged from crates coming in from mills. Result: High costs, delays, customer complaints of damage.

NAAD's Commercial Practices C mittee determined that a simple, st ard procedure of packaging was poss and the crating cart was conceived.

Made by Progressive Mfg. Co., Kansas Ave., Kansas City 5, Mo., cart is made of steel, has a capacit 2000 pounds, and is so accurately anced it can be moved by one mar

Use of the cart allows all size sheets, up to 48 x 144 inches, an lots up to 1000 pounds, to be crate the same method. Four sizes of rugated board and five lengths of 1 inch pine slats and steel strapping the crating materials needed.

Following tests, NAAD recomme the crating cart's use to its men and wrote a manual on its use. report a saving of 75% in crating

■ ***Top photo shows crating cart read a sheet crating job. Men have p lower slats on cart (dark membe photo), will next lay lower sheet o rugated cardboard. Note jig-type nels which hold slats for various crates in exactly the right position.***

Center photo: Cart top has wheeled to rack, tilted to near ve position so that men can conven move metal sheets to cart. Locking (below sheet) help position sheets rately within crate.

Bottom photo: Finished crate on ready for delivery.

HOMOGENIZING FURNACE

ANLY HI-TEMP PANELS are operating at mperatures up to 1250° F. Contrasted with nventional brick construction, they afford the llowing:
Lower initial material investment cost.
Lower installation cost.
Lower maintenance cost.
Lower operating cost.

The development of LANLY HI-TEMP PANELS made possible this aluminum billet homogenizing furnace.
Available in either hot car or car bottom type, it is representative of the many Lanly installations in the light metals industry.

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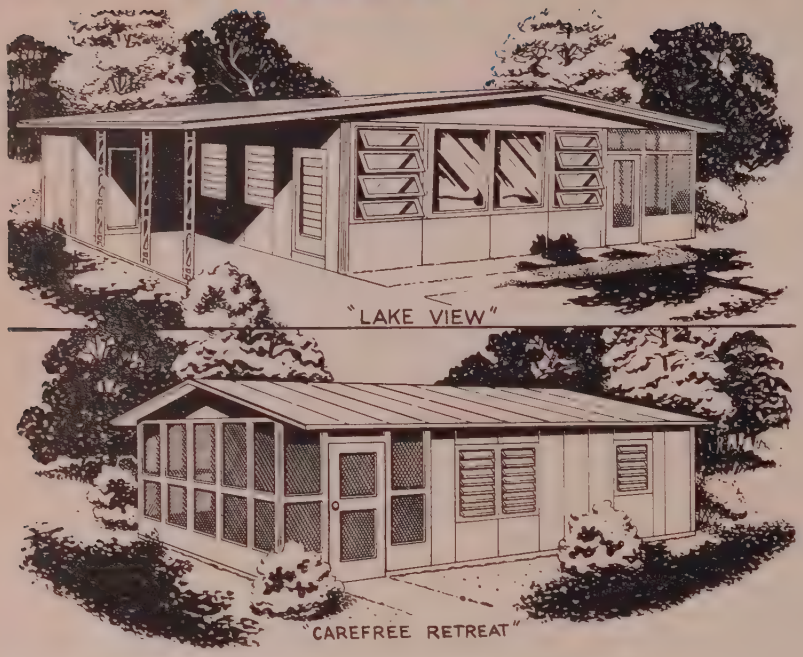


Small Prefabs in Three Models Are Erected Quickly

A series of prefabricated cottages are being produced by Florida Industries, Tampa, Fla. Basic construction material is an aluminum-styrofoam sandwich panel. The panels interlock and are completely interchangeable. The roof is also aluminum.

Each Color-Craft panel is said to interlock with all other panels with Erector-Set precision and, according to Florida Industries vice president John Liner, a moderately handy man and an unskilled helper can easily set up the whole cottage in five days after preparation of the slab and installation of plumbing.

Exterior walls are available in leather grain aluminum finish or in baked-on enamel pastel colors. Interiors can be one of the outside finishes or can be one of several attractive wood grain finishes.

Three models have been introduced for immediate delivery. The Carefree model will sell at the retail level for around $3500. A more spacious Holiday model will sell for about $4700, while the top model in the line, called Lakeview, will sell for about $5500. All three types are considered suitable for vacation cottages or retirement homes.

The Color-Craft panels have also been applied to vestibule designs developed by Florida Industries. Later on, the company intends to adapt the cottages for use as office buildings.

Continental Can Extends Aluminum Can Program

Continental Can Co.'s program of offering one-quart aluminum oil cans at the same price as the present steel cans, for large-scale commercial tests by oil companies, has proved so successful it has been extended through 1960, Reuben L. Perin, executive vice president of the Metal Division, announced.

The offer was scheduled to expire this past August. Twelve major refiners have participated in the tests, Perin said, and shipments of aluminum oil cans are expected to reach an annual rate of 200 million units by the end of this year.

Steel oil cans sell for approximately $50 a thousand. Aluminum sheet prices would ordinarily require that aluminum oil cans sell for somewhat more.

Empty aluminum cans weigh only about a third as much as steel cans, and a filled aluminum oil can weighs 8% less than a filled steel can, so there is a significant potential saving for the oil industry in transportation costs. Other advantages of aluminum cans include greater resistance to corrosion than steel, easier opening and removal of the device used to funnel the oil into the crankcase, and more convenient disposal of empty cans.

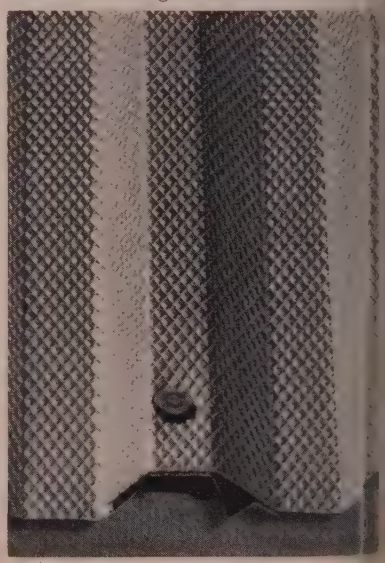
The refiners' tests to date have indicated that the greater corrosion resistance of aluminum oil cans pays especially at service stations, where cans are exposed to weather on island displays and are sometimes stored for long periods in wet basements.

Although no scrap recovery effort for the aluminum cans is programmed by Continental Can, service station operators in some parts of the country will be able to sell used cans to local scrap dealers, whereas used steel cans ordinarily are hauled away as trash.

The announcement emphasized that the current competitive price offer for aluminum cans applies to one quart non-refillable cans for lubricating oil, of which about 1.5 billion units are produced each year.

It pointed out that while the present cost of aluminum cans generally is higher than that of tinplate cans, the merchandising advantages of aluminum, apart from its lighter weight, are expected to offset the cost difference in many packaging applications where the cost of the container is small in relation to the price of the product. Aluminum is well suited to lithography, and three-piece aluminum cans such as the oil cans carry eye-catching labels printed directly on the metal.

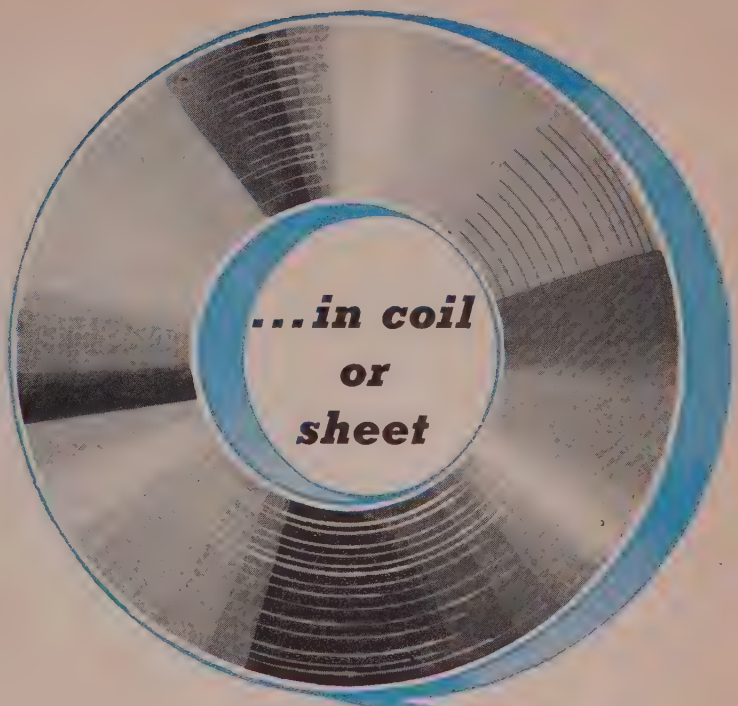
Continental Can is now manufacturing aluminum oil cans at plants in Los Angeles, St. Louis, Oil City, Pa., and Oakland, Calif., and additional can manufacturing lines will be converted as aluminum can volume develops in other marketing areas of the country.



New Farm Roofing Marketed by Reynolds

Two new aluminum farm roofing products featuring a revolutionary purlin ping device were introduced last month by Reynolds Metals Co.

Reynolds will market a heavy (.0[illegible] gauge diamond embossed roofing and

HERE'S YOUR FINISHING DEPARTMENT...

MORE AND MORE users of coated coil and flat sheet are looking to Pre Finish Metals, Inc. for ready solutions to their finishing problems in aluminum, magnesium, steel, stainless steel, or tinplate. Here's why:

CAPACITY: Pre Finish Metals' two coil coating lines and one flat sheet line can make the big coated sheet orders look like small ones. Small orders receive equal attention.

WIDEST coated flat sheet in the industry is produced by Pre Finish Metals. Flat sheet widths from 18" to 60"; lengths from 4' to 12'; thicknesses from .004" to plate.

COIL is coated in widths from ½" to 18"; gauges from .004" to .062".

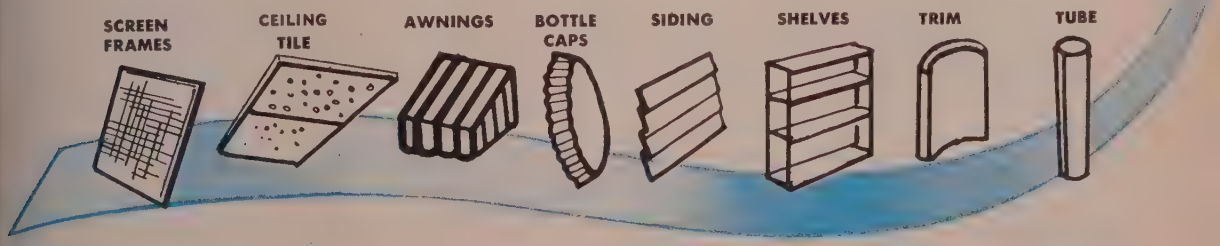
ALL COLORS, standard or special. We'll match colors to your most exacting specifications.

DEPENDABLE laboratory tested coatings — whether organosol, plastisol, epoxy, vinyl, acrylic or alkyd base, Pre Finish coatings are on to stay to help your product do the job it was designed to do.

FABRICATING toughness: You can roll form, draw, punch or stamp Pre Finish coated sheet without flaking, chipping or crazing of the smooth painted surface. Bonderite® prepaint treatment assures a tenacious paint bond and increased resistance to corrosion.

QUALITY CONTROL: Facilities of our new research and testing center are unsurpassed in the metal coating industry.

ALSO, roller coated imprinting of brand names, symbols, other identification.



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a lighter (.019) gauge "all-purpose" stucco-embossed roofing, it was announced by James W. Benton, manager of farm markets for the company's building products division.

"The new 'Rainlock' lapping feature (see lower part of photo) outmodes all other lapping systems," Benton said. "It is the most important innovation in farm roofing since Reynolds pioneered aluminum farm roofing in 1945."

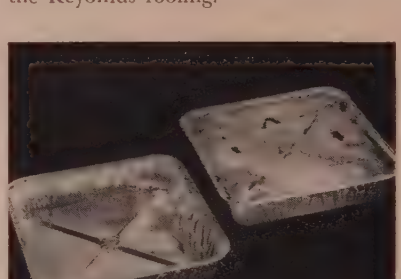
The system has the V channel over to the side instead of in the center of the rib. This permits top-nailing, eliminates unattractive sagging and bulging of the metal between purlins on the underside, and insures a tighter, leak-proof roof.

"In the past, this type of roofing has had to be nailed at an angle alongside the rib, a difficult task to perform without ripping or damaging the metal," Benton said. "As a result, the farmer usually went ahead and top-nailed anyway, thus puncturing the V channel and inviting leakage."

With top-nailing, the new "Rainlock" roofing will be easy to apply, saving time and money. It has a non-syphoning drain to block any possibility of leakage at the side lap.

The new farm roofing will come in 50-inch widths for easy 48-inch coverage between purlins. It will be available in lengths from 6 to 16 feet.

Both of the new products will carry a "Lifetime" warranty as well as the Reynolds "Certificate of Guaranteed Equity." This written equity guarantees that Reynolds will allow, for the life of the roofing, a repurchase value of not less than 10 cents per pound. Thus a farmer can obtain a higher appraisal value for farm structures covered with the Reyonlds roofing.



New Foil Containers for Mass Feeding Outlets

Four new rigid foil containers have been introduced by Cochran Continental Container Corp., Louisville, Ky., wholly owned subsidiary of Anaconda Aluminum Co. The multi-purpose containers will be distributed to retail bakers, hotels, restaurants, institutio and other mass-feeding outlets.

The new containers are supplied .0035-inch aluminum foil, with a bea flange, for overwrapping or adapta for lid closures.

The first is a new 16-ounce oblo container identified as No. 453. Meas ing 5¾ x 4¾-inch top-out, with a sl depth of 1½ inches, this item is tended for packaging of entrees, ch egg rolls, meat loaf, fruit cakes, sal nuts, assorted candies, coated mints,

No. 488 is a square general-purp cake and pastry pan, 8¾ x 8¾-i square top-out, with a slant depth 1½ inches. It will serve for a variety family-sized cakes, open fresh-fruit ca sweet rolls, sticky buns, coffee cake, similar items.

A special adaptation of No. 488 488-R, having an embossed four- tional divider ⅛-inch high in the tom of the pan. This container designed for apple turnovers: the bossed dividers retain the shape of turnovers during the cooking proc and prevent the dough from runn together.

Cochran Continental No. 596 i round container appropriate for shal coffee cake, Danish pastry, fudge, bro ies, pizza, etc. Its measurements 9⅞-inch top-out, 9¼-inch top-in, 9-inch bottom, with a depth of ⅝ i

These four new foil containers considered to offer increased flexib in food packaging and are expected make an important contribution to ever-growing "convenience" food r ket.

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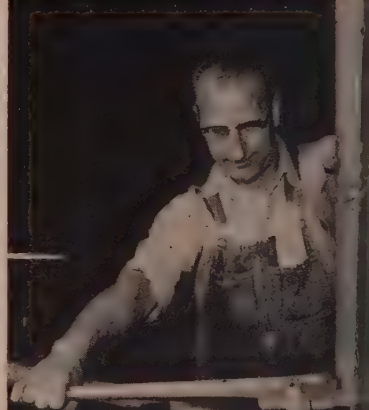
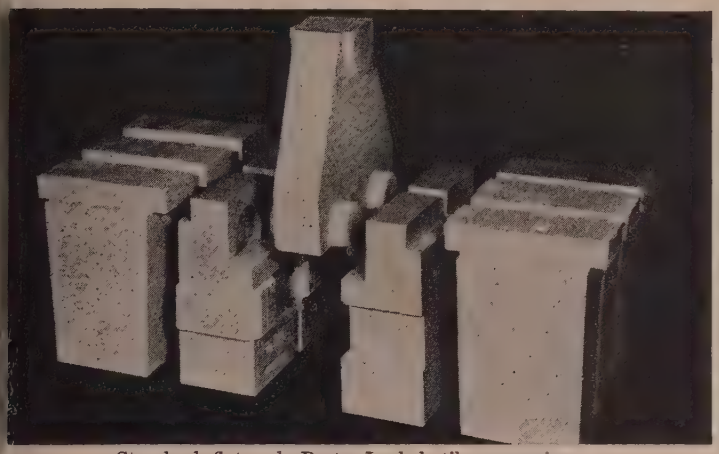


Lightweight Wrench Meets High Strength Needs

A lightweight aluminum wrench es pecially designed to meet high stre requirements is being manufacture b Schick Products, Inc., Box 867, Beln Calif.

The wrench is the first of its

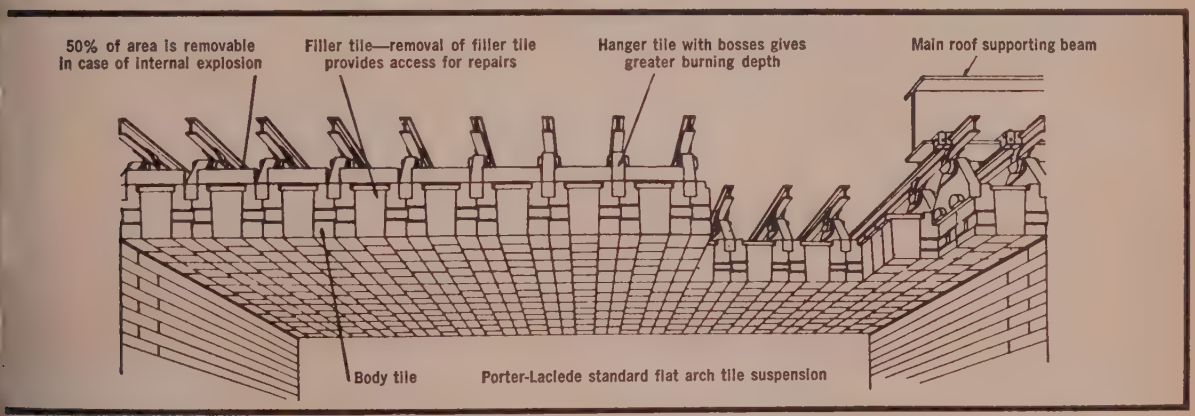
Porter-Laclede suspension is a "safety valve" against aluminum furnace explosions



Standard, flat arch, Porter Laclede tile suspension.

Looking for real blow-off protection? A Porter-engineered, Laclede Tile Suspended Arch "gives" with any serious explosive force, taking pressure off walls and bottom. Keeps walls and bottom in tact; no dangerous metal escape.

After an explosion, or where roof repairs are required, this roof can be "hot patched" . . . by replacing individually damaged tile, *without shutting down!*


50% of area is removable in case of internal explosion
Filler tile—removal of filler tile provides access for repairs
Hanger tile with bosses gives greater burning depth
Main roof supporting beam
Body tile
Porter-Laclede standard flat arch tile suspension

Assembly of components for Porter Laclede suspension.

Compare these Porter features:

- High safety factor
- Unequaled ease of installation and repair
- Strong resistance to erosion and spalling with Duo-Seal tile
- Unique provision for expansion
- Strong construction—a test load of 1,000 lbs. supported from one hanger tile
- Elimination of cumulate load against tile on slopes
- Applicable to any roof contour

Porter Tile Suspension can be fabricated from any specified refractory material. For complete information on aluminum furnace roofs, or *any* refractory application, write: *Refractories Division, H. K. Porter Company, Inc., Porter Building, Pittsburgh 19, Pa.*

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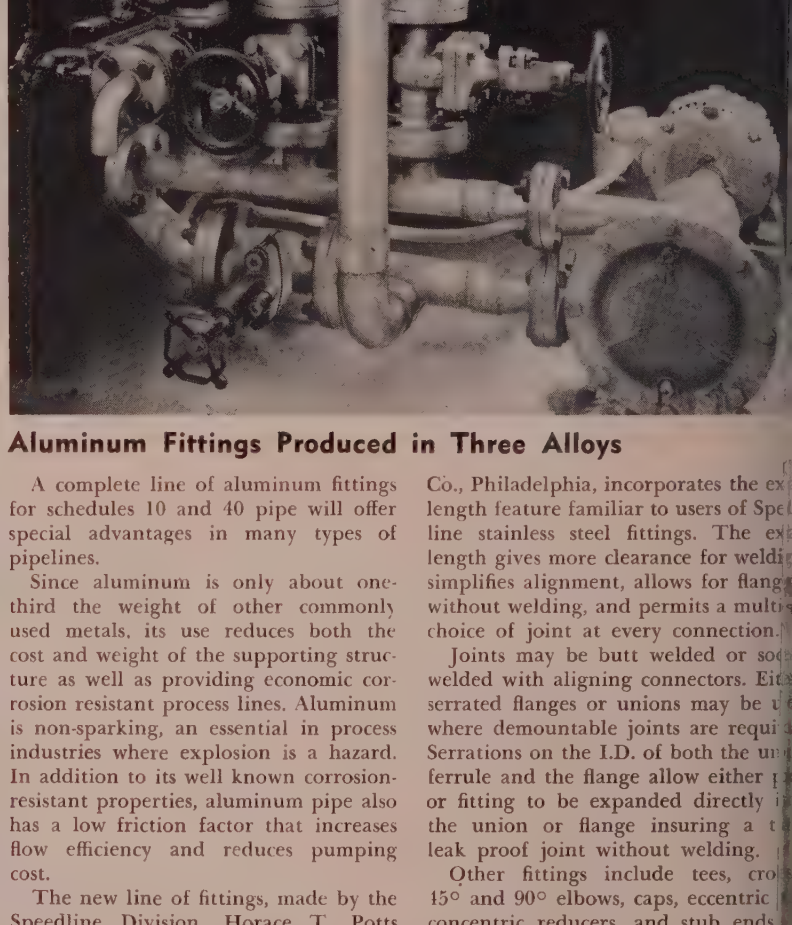
forged wholly from aluminum bar stock to meet U. S. Standards GGG-W-651C for heavy duty strength requirements, and Mil-W-1976 for maximum safety, according to the company.

Approximately 66% lighter than malleable iron wrenches, the Schick wrench is made of Kaiser Aluminum's alloy 2014 and is available in 10, 14, 18, 36 and 48-inch long sizes with ja capacities of 1½, 2, 2½, 3, 4½ and inches.

Standard models have insert steel ja which are replaceable. A safety wren with non-sparking beryllium-copper ja also is available.



Aluminum Fittings Produced in Three Alloys

A complete line of aluminum fittings for schedules 10 and 40 pipe will offer special advantages in many types of pipelines.

Since aluminum is only about one-third the weight of other commonly used metals, its use reduces both the cost and weight of the supporting structure as well as providing economic corrosion resistant process lines. Aluminum is non-sparking, an essential in process industries where explosion is a hazard. In addition to its well known corrosion-resistant properties, aluminum pipe also has a low friction factor that increases flow efficiency and reduces pumping cost.

The new line of fittings, made by the Speedline Division, Horace T. Potts Co., Philadelphia, incorporates the ex length feature familiar to users of Spe line stainless steel fittings. The ex length gives more clearance for weldi simplifies alignment, allows for flang without welding, and permits a multi choice of joint at every connection.

Joints may be butt welded or so welded with aligning connectors. Eit serrated flanges or unions may be u where demountable joints are requi Serrations on the I.D. of both the un ferrule and the flange allow either p or fitting to be expanded directly i the union or flange insuring a t leak proof joint without welding.

Other fittings include tees, cro 45° and 90° elbows, caps, eccentric concentric reducers, and stub ends

Reynolds Supplements Tube Sheet Tooling Equipment

Reynolds Metals Company, Richmond 18 Va., has given the Pittsburgh Engineering and Machine Division of the Pittsburgh Steel Foundry Corp., Glassport, Pa., an order to rebuild an existing four-high hot rolling mill measuring 18 x 38 x 48 inches. This is part of an approximate million-dollar rebuilding program for the Tube Sheet Section of the Louisville No. 14 plant.

After rebuilding, the mill will be used to roll a sandwiched pair of aluminum sheets 45 inches wide and reduce the thickness from .250 in. to .085 in. in one pass. The sheets will be used form refrigerator coil coolant sect

The new design of the rolling will improve the quality of tube sh

"New and improved products re ing from the accelerated research the aluminum industry present eve creasing problems of tooling," a nolds executive said. "To efficiently competitively meet this challenge, company has initiated a progra re-engineering and rebuilding exi equipment to supplement new e ment purchases in our tooling progr

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(Chicago Suburb)

New Oil-Sand Binder Improves Nonferrous Castings

Britecast"O" is a new oil-sand binder that is reported to produce precision castings with regular green sand equipment. The new binder is based on the mineral attapulgite and is said to improve the quality of nonferrous castings. Results with aluminum, magnesium and bronze have been excellent, according to Minerals & Chemicals Corp. of America, Menlo Park, N. J.

Because there is no steam to escape during pouring, finer grades of sand can be used, producing castings with improved surface finish.

Britecast "O" is used with mineral oil and fine silica sand. One-hundred pound batches mull quickly in 3 to 5 minutes and inflammable or toxic solvents are not required during mulling. Sand bonded with new material is almost 100% re-usable, and make-up is said to be very low. Water sands can be easily converted to Britecast "O" after drying and synthetic sands bonded with modified bentonite can be converted progressively by adding enough of the new binder to maintain green strength until conversion is complete.

The new binder is available in 50-pound multi-wall bags.

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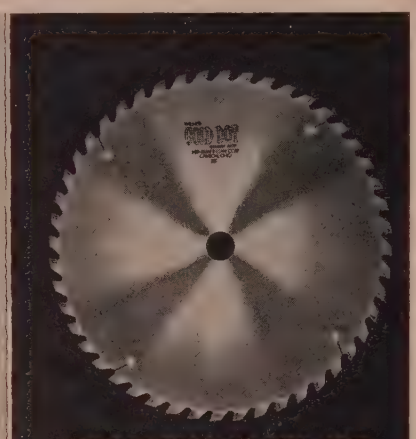

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Aluminum-Wound Coils To Challenge Copper Wire

Current activities of over a do manufacturers of electromagnetic c indicate that aluminum strip is ab to make sizeable inroads into the field — heretofore one of copper wi major markets. This was revealed R. R. Cope, head of the strip conduc program for Aluminum Co. of Amer in commenting on the results of Alc year-old coil development program.

Alcoa has been making strip-wo coils in the transformer division Alcoa Research Laboratories. The b of these — over 200 different coi have been wound to specifications s plied by some 150 coil manufactur Alcoa has supplied them with th sample coils for testing and evaluat Some of Alcoa's prototype strip-wo coils are pictured.

The Alcoa program has been a m factor in directing attention to alu num strip windings, Cope said. though the strip conductor princ dates from the late 1800's, and whil least one major company — Square Company's E. C. & M. Div., Clevela has been producing strip coils (for l lifting magnets) for 30 years, gen interest in the potential of the mat has arisen only since World War I

Two programs antedate the A activity by several years. The firs these is a long-range, continuing inv gation by General Electric Compa initiated in 1945. This program ha voted considerable study to alumi strip conductors.

The second early activity was a s of investigations of strip winding rials and equipment, still under begun in 1953 and 1954 by such panies as American Machine & Foun Co., Stamford, Conn.; Automatio struments, Inc., Boulder, Colo.; Good-All Electric Mfg. Co., Oga Neb.

Objective of these studies is to re

and weight of coils, and auto- their production.

e Alcoa activity is broader in its tives. Its logical aim is to create a new market for aluminum. It has ed attention to both large and coils, seeking to explore possible gs in labor and cost of materials, gh the employment of aluminum conductors.

pe indicated that aluminum strip- d coils are about to become a al market item. Currently in pro- on, or scheduled to be so, are the wing types of strip-wound coils: ype distribution transformers, air- and electronic solenoids, motor le alternators, clutch coils for heavy equipment, lifting magnets, and welding equipment. At least five ufacturers are ready to custom-wind type of strip coil.

justable Tongs Handle ls Carefully, Quickly

oils of strip aluminum are handled kly but carefully with a recently loped type of vertical coil tongs. anufactured by the Materials Han- g Division of Heppenstall Co., New hton, Pa., the tongs are of a new gn that will handle a wide range of sizes even where headroom is ex- ely limited. They can be adjusted outside diameters from 25 to 40 es and for inside diameters from 3 inches, yet have a maximum height nly 27 inches when fully extended arrying a load.

lthough light in weight, the tongs carry coils weighing up to 1,000 nds. They are pictured in operation Kaiser Aluminum's Ravenswood, W. works.

o pick up a coil, the operator lowers tongs with their levers latched and the gripping shoes at a pre-set posi- that allows sufficient clearance for y over the coil wall. When the gs rest on the coil, the operator pulls the frame toward him until the fixed inner shoe makes contact against the inner diameter of the coil, and then pushes the outer shoe against the out- side diameter of the coil, where it is held by a ratchet. The tongs are then ready to lift the load.

Raising the tongs releases the levers, causing the shoes to grip the coil firmly, but without damage. When the coil is safely delivered, and again rests on a firm surface, the operator lowers the tongs another inch or two to bring their levers to the latched position again. He then lifts the pawl of the ratchet and withdraws the outer shoe sufficiently to allow removal of the tongs.

The under surface of the tongs' frame is lined to protect the top surface of the coil. Use of shoe adapters for vary- ing inside diameters insures holding coils level when lifting them.

New Cutting Oil Has Greater Stability

A new premium quality soluble cut- ting oil, formulated specifically to pro- vide maximum stability in cutting soft alloys (aluminum, stainless steel, copper, etc.) has been developed by Shear-Speed Chemical Products, Division of Michi- gan Tool Co., 7125 E. McNichols Rd., Detroit 12.

Called AL-HD, this high-lubricity oil is said to have demonstrated material savings through longer tool life, less down-time and fewer sharpenings and dressings. Its use will also help attain finer surface finishes on many machin- ing operations, such as boring, broach- ing, drilling, hobbing, tapping and turning.

AL-HD remains chemically neutral (pH 7.5-8.0) over a maximum range of temperatures and operating conditions,

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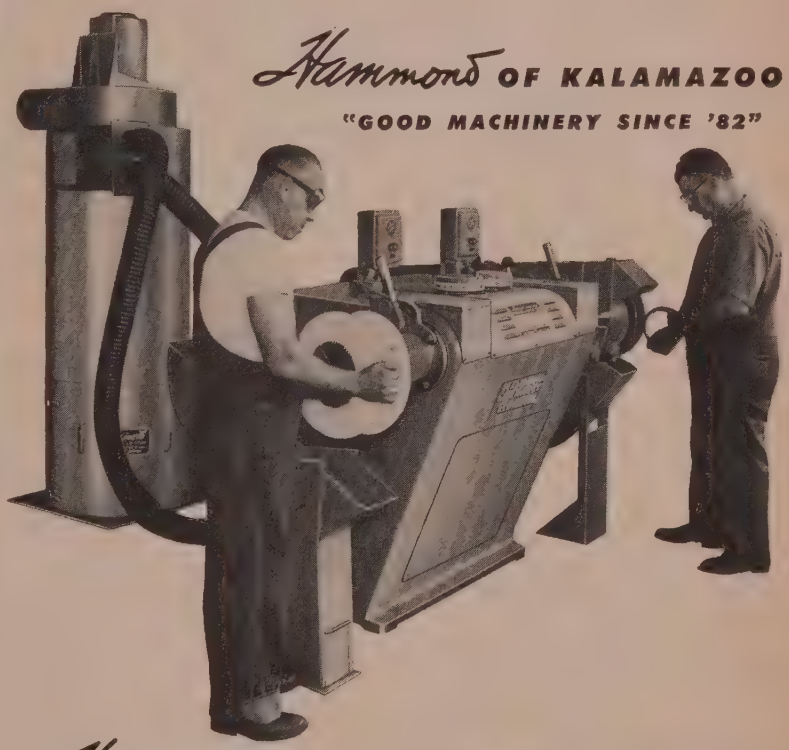

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providing high penetration around the cutting edge through low surface tension and superior wetting qualities, even in hardest water. Immune to low temperatures in shipment and storage, AL-HD also may be left in machines during shut downs without skinning, gelation, sedimentation, sludging, etc.

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Cast, Forged Parts Given Super-Hard Welded Zones

Aluminum castings and forgings with precision-welded zones of super-hardness and high wear resistance are a new development of Alcoa Research Laboratories.

When applied to selected areas of commercial aluminum products, new aluminum welding alloys retain this hardness at very high temperatures. Thus, aluminum parts with zones of the hard welding metal are expected to find use in many automotive applications where localized hardness, wear and heat resistance are desired.

In the example pictured, an aluminum diesel engine piston has been given welded zones of four hard ARL- oped welding alloys for a ring g test. Brake drums, valve seats sheaves are other prospective a tions for the zoned weldments.

According to Alcoa research eng one of the new alloys provides a hardness of 250 at room tempera as hard as heat-resistant high-alloy Comparable commercial aluminu tons usually have 110 Brinell ha

At 500°F. the new welding provide areas four times as h commercial aluminum piston co tions at this temperature, the L tories engineers said.

Alcan Closes Magnesium Plant

Aluminum Co. of Canada has closed its 4000-ton-capacity primary magnesium plant at Arvida, Quebec. This plant had been producing magnesium needed to alloy aluminum, and never operated at capacity; nor was it considered economical to operate.

Alcan will now buy its magnesium from Dominion Magnesium, Ltd., in Canada, and from The Dow Chemical Co. on an exchange basis for aluminum. Dow will use the aluminum at its new fabricating division, The Dow Metal Products Co.

Bridgeport Buys Aluminum Rolling Mill

Bridgeport Brass Co. has bou aluminum strip rolling mill fro General Services Administratio $1,325,000. The plant is locat Warren, Ohio.

Bridgeport Brass operates an alu num extrusion and forging pl Adrian, Mich., which is also owned the U. S. Government. Its Hunte sion in Riverside, Calif., has co casting and rolling facilities an duces aluminum strip. In ad Bridgeport has a plant in New which fabricates aluminum strip

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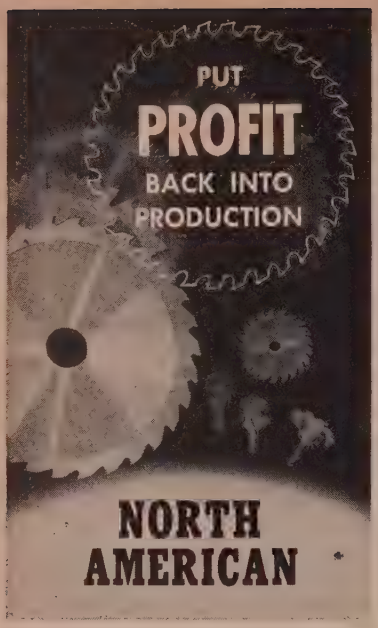

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(Vicinity of St. Louis)

New Type Fishing Boats At Work Off Alaska

Ten aluminum gillnetters, new among American fishing boats, are at work in Alaska salmon fisheries after Puget Sound tests. (Gill nets catch fish by their gills.) The boats were built by Marine Construction & Design Co., Seattle, for Harold Daubenspeck of Kenai Packers.

Marco (Marine Construction & Design) reported that the aluminum gillnetters, powered by 165-hp gasoline engines, had a speed of 15 knots in preliminary tests, compared with eight or nine knots for most gillnetters.

In addition to speed, which is important in Alaskan waters where the fishing season is short and fishing hours are regulated, load capacity, efficiency and quietness of operation were noted by fishermen who were aboard during test runs. The aluminum hulls are unpainted and need no maintenance

The boats are 32 feet long, wi beam of 11 feet, 6 inches and a dra 31 inches. They are of all-welded struction, utilizing Kaiser Alumi alloys 5086 (sheet) and 5083 (sha Kaiser Aluminum & Chemical provided technical assistance du construction.

While the boats are intended for netting in Cook Inlet, Alaska, M announced they could be rigged for Bristol Bay fishing. The 32 length meets the Bristol Bay limit.

Bruce Whittemore, marine arch who designed the boats, estimates are only two-thirds the total weigh other comparable boats. Fish cap is about 27,000 pounds each. Eac designed for operation by two men can sleep aboard if necessary.

High Temperature Tube Swaged By New Technique

A new cold draw forming technique for swaging high strength, heat resistant alloy tubing has been developed by manufacturing research engineers at Boeing Airplane Co., Seattle.

Developed as a structural application for anticipated hypersonic vehicles, the process utilizes nested aluminum tubing to prevent collapse of the super alloy during swaging. The aluminum tube is then scrapped. Buckling, cracking, wrinkling, bulge and flare problems also were overcome in the development of the process.

Through an eight-stage reduction with inter-stage anneals, the end of a 2-inch diameter 0.01-inch wall welded M-252 tube was reduced and smoothly tapered on a 10-degree angle to ½-inch diameter. The reduced tube diameter, thickened to 0.33 inch, permitted joining several structural elements in several different planes at a single point.

The increased thickness also makes the tubing acceptable for conventional joining techniques with no increase in

over-all weight. A standard engine shown in picture was used as source in the initial development, conventional drawing dies of A bronze.

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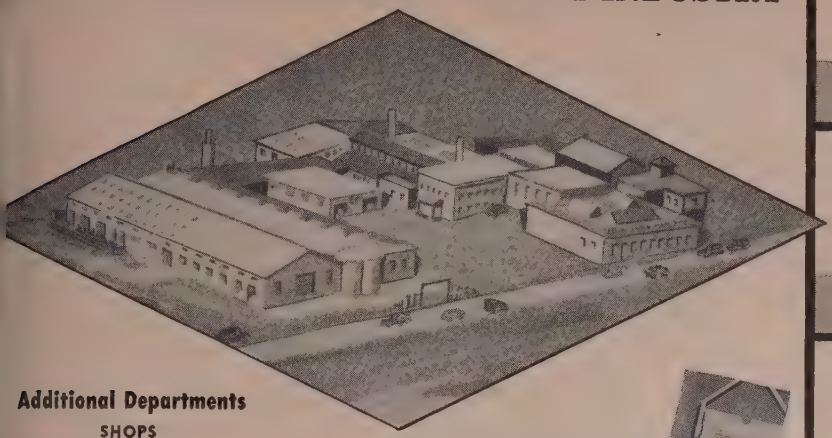

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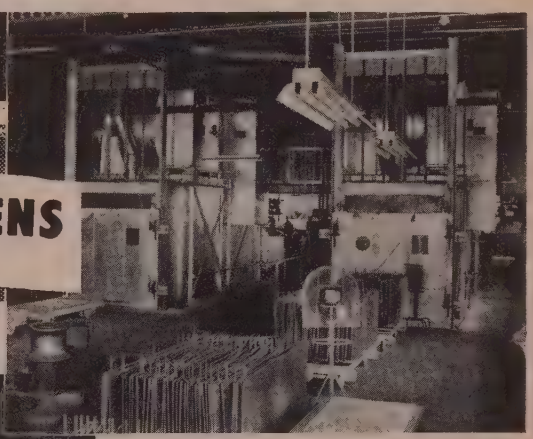

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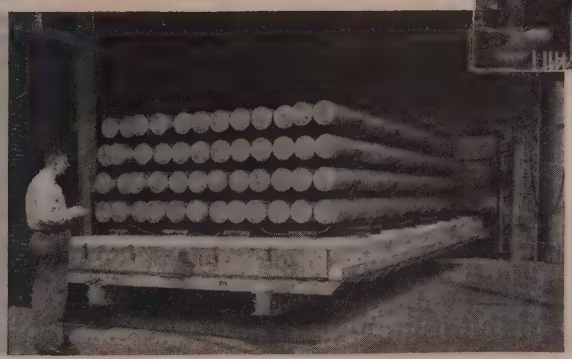

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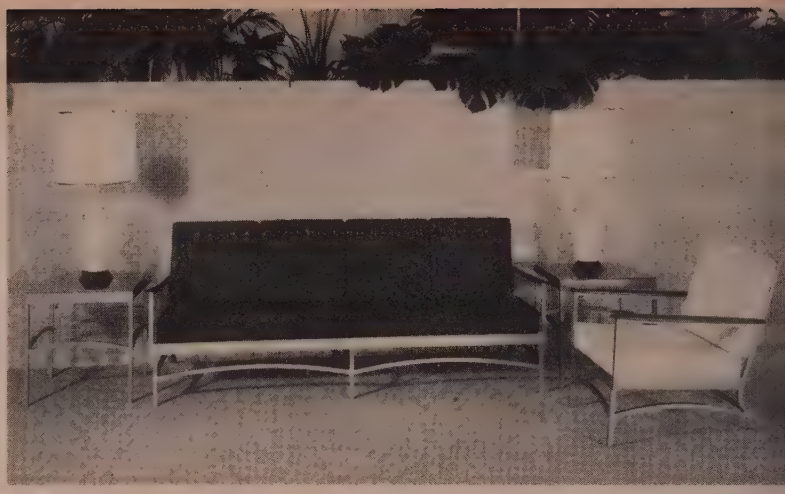


Aluminum Lines Win Furniture Design, Engineering Awar

Two new types of furniture, both made of aluminum, walked off with the coveted Apollo awards at this year's fall meeting of the Summer & Casual Furniture Manufacturers Association.

The Bal-Harbour line of indoor furniture made by AFCO Aluminum Furniture Co., Miami, Fla., took the prize for outstanding design, while the award for engineering achievement went to Macon Umbrella Corp., Brooklyn, N.Y., for its new folding aluminum-top umbrella.

Designed exclusively for interior use, AFCO's Bal-Harbour group consists of five seating pieces and three tables. The frames of all pieces are constructed aluminum square tube and extrud shapes.

Styling effects that are unusual metal furniture were achieved by ber ing tubular aluminum support eleme in graceful curves (see photo). Enamel colors include antique white, aztec go and turquoise.

The meeting of the Summer a Casual Furniture Manufacturers Asso ation was staged in conjunction with t annual fall International Home Furni ings Market, held October 19-23 at t American Furniture Mart in Chica

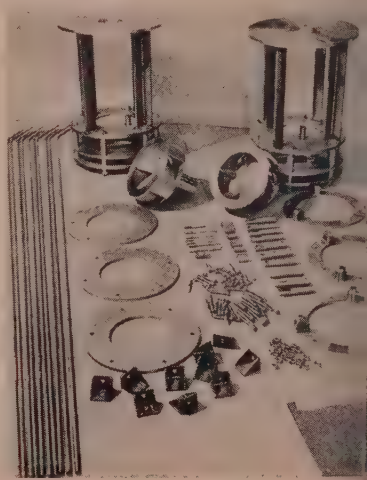
Titanium Pump Resists Corrosive Liquor

An all-titanium pachuca pump was recently fabricated by The Pfaudler Co., a division of Pfaudler Permutit, Inc., Rochester, N. Y. The pump will be used to clarify a highly corrosive liquor in a pachuca tank — a wooden vessel approximately 15 feet in diameter by 30 feet long.

Titanium was selected as the material of construction because of its exceptional resistance to corrosion. It is resistant to many acids, chlorides, hypochlorites and salts. Because of other inherent characteristics, special techniques are required for fabricating and welding the material. The various pump parts are pictured.

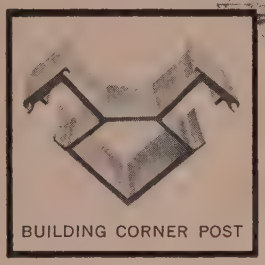
In process, the titanium pachuca pump is suspended from the vessel top-head. One end of a 10-inch diameter, 25-foot-long rubber suction hose is attached to the bottom of the pump. The other end is immersed in the unclear electrolytic solution. The pump pulls the corrosive medium up through the rubber hose and sprays it back into the vessel. This continuous agitation causes impurities to float to the top of the liquor where it can be skimmed off.

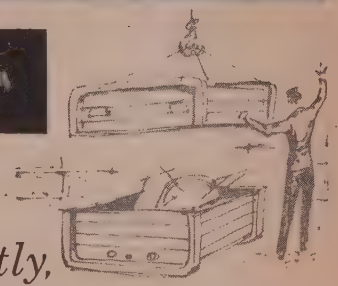
Prior to installing the titanium pump,



a massive type 316 stainless steel pu was used. The new pump is only 2 inches long by 14 inches diameter peller, with a 10-inch suction.

Pfaudler performed all machin cutting, trimming and welding op tions. Both cast and welded titan impellers were fabricated for evaluat and both proved completely satisfac after testing.





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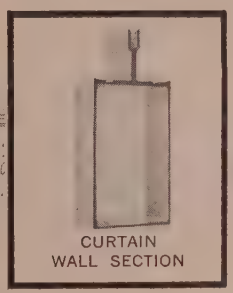

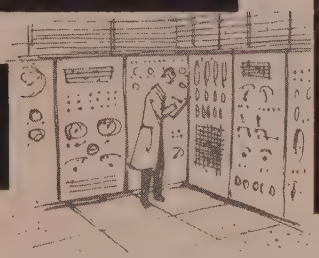

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HARVEY Aluminum

Two Extruders Close Youngstown Plants

In the hub of the aluminum extrusion area, Youngstown Mfg. has announced that it is closing down its Youngstown, Ohio plant, which had been idled by a strike in September. The plant had employed 250 persons.

According to the company, the United Steel Workers union wanted higher wages and "super seniority" for union officials which would keep them at work in preference to employees with more than 30 years' seniority. The company said the plant is no longer competitive with other extruders who operate in low wage districts. Youngstown Mfg. will continue to operate its plant in Louisburg, N. C., which employs about 150.

Another Youngstown area plant was shut down by Textron Metals Corp. which was jointly owned by Olin Mathieson and Textron. The plant was built about 10 years ago by Ben Friedkin and was called Benada Aluminum. This plant, together with other Benada facilities, was sold to Textron for around $10 million some three years ago, but has steadily lost ground since then. At one time it employed abo 800 people making extrusions, windo and doors.

Almost all of the plant equipm has been moved to Textron's plant Pottsville, Pa. When its doors w closed last month, only 30 to 40 ployees were affected.

High Gloss Enameled Sheet for Mobile Homes

A lustrous enamel-on-aluminum sh product has been developed by R nolds Metals Co., primarily for mo homes industry consumption. The c ing is a Du Pont-developed Lucite acr baked enamel. Said to be the most d able ever offered, the product is be sold in coiled or flat form in six col

The finish is applied by roller coa on strip and may be used for sub quent forming. It is non-chalking, tains its high gloss and durability, is painted on one or both sides in same or different colors. Reynolds pl to promote its use for building par shingles, siding, and pipe jacketing.

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This Model SF Lock Seam Tube Mill is forming TV table legs of 5/8" O.D., .016" wall simulated brass, at 120 f.p.m. Cutoff is ARDCOR Model 10 Press with 1-1/2" stroke, 60 strokes per min.

The new small Model SF ARDCOR Machine features: High production speeds; roll space 5.5"; spindles 1.5"; new style rugged base with tool compartment and slanted front recessed for better operator stance; special narrow side roll stands with close 10" horizontal centers; fixed spur gears; quiet running all V-belt drive; compact 3-roll straightener; low voltage protection. Basic machine readily converted to a Cold Roll Forming Machine.

ARDCOR Roll Forming Machines and Lock Seam Tube Mills are available in seven standard sizes, other sizes to customer specifications.

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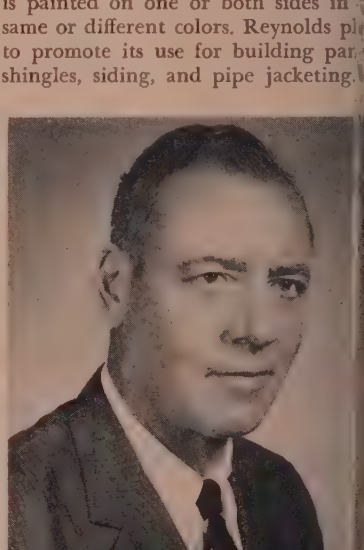

First Metal Produced at Alabama Magnesium Pla

The first new primary reduction p to enter the magnesium business mercially and to compete with Chemical Co. started operations month in Selma, Ala. According Lester White (pictured), presiden the firm, the plant has a capacit 7000 tons of high purity magne annually.

The corporation, which is jo owned by Calumet & Hecla, Inc., cago, and Brooks & Perkins, Inc., troit, produces magnesium from mite ore, using the ferrosilicon r tion process. Construction began December, will be almost complete November 11th.

Brooks & Perkins, largest magne fabricator, purchased the first

n Alamet October 1 for rolling mag-
ium alloy sheet and plate. Alamet
xpected to be a major supplier to
oks & Perkins. There is good pos-
lity that Wolverine Tube, a division
Calumet & Hecla, will try to use
gnesium for fabricating. Wolverine
major fabricator of aluminum and
per.

f Alamet sells its entire output, it
l account for about 14% of total
S. demand — which is now about
000 tons annually.

ajor Price Cut
r Building Sheet

In a move to capture a big chunk of
galvanized steel market, Alcoa this
nth announced substantially lower
ces for Alcoa Building Sheet—a "new"
oduct for industrial and residential
ilding. Called a "standard" item,
d marketed in coils or flat sheet,
product is fabricated from one
oy and is said to replace other sheet
oys for building applications.

Alcoa says the product's higher me-
anical properties offer added ad-
ntages. Typical properties in H12
mper are: Ultimate tensile, 26,000
i; yield, 25,000 psi; elongation, 10%
2 inches. The sheet alloy will with-
nd a 180° bend around a radius of
T.

Although it is made in many widths,
uges and tempers Alcoa Building
eet is available only in mill finish
stucco pattern. It is supplied in Al-
d form as standard, but is available
$.005 per pound less in bare sheet.
Base price of 100,000 pounds of .080
ill finish material in 6- to 12-inch
idths is 34.5c per pound. At .024 inch
ick it costs 36c a pound. In orders of
ss than 100,000 pounds, the sheet costs
penny more. Coiled Alclad .125-inch
eet costs 30c a pound.

The new prices are roughly 5c under
her sheet prices. Alcoa stresses the
ct that the new product is not "hand
lled," comes only in mill finish and
intended for big users. But independ-
nt sheet rolling mills insist it is an-
ther "commodity" price; that every
eet product from now on will be
ommodity; that it's "the first step to
rive the small mills out of business."

Others are waiting to see what the
teel mills will do when they resume
roduction of galvanized. Whatever its
ffect on independent rolling mills, Al-
oa's new building sheet can boost ac-
eptance of aluminum for building
anels, ceilings, roofing and siding,
loors, shutters, rain carrying systems,
nd climate control products.

It may also encourage many roll
ormers to take a new look at aluminum
pplications, particularly those made of
xtrusions.

Men-on-the-move

Aluminum Co. of America has appointed **William R. Butler** manager of casting sales. He has been in charge of die casting sales since 1955, and now will be responsible for the sale of sand, die, permanent mold and plaster mold castings. It's the first time the sale of all foundry products has been grouped in one department. Butler is a veteran of 34 years with Alcoa, is a graduate metallurgist who has served in several sales executive capacities in the company.

Manual Tama has been named vice president in charge of the Ajax Engineering Division of Ajax Magnethermic Corp., Youngstown, Ohio. He has been vice president of Ajax Engineering Corp. since its formation in 1941, and was elected president last year. **Melvin A. Raney** has been appointed vice president in charge of the Ajax Magnethermic Division. He comes to Ajax-Magnethermic from The Taylor-Winfield Corp., Warren, Ohio, where he had charge of manufacturing. Both Tama

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Men-on-the-Move

(Continued)

and Raney will be headquartered in Trenton, N. J. Ajax-Magnethermic Corp. is a leading manufacturer of induction heating equipment.

Harold Fells has joined Allen-Stevens Corp., Woodside, N. Y. as a window engineering specialist. With 20 years' experience as a mechanical engineer, including eight years in the aluminum extrusion and window field, Fells will guide Allen-Stevens' window and door customers in the efficient and economical use of window hardware and coordinate design and tooling. The firm is a volume producer of die cast aluminum window hardware.

Kaiser Aluminum & Chemical Corp. has named **Edwin W. Fish** manager of a new market development department as part of the company's accelerated effort to bring major potential aluminum markets to full commercial status. Fish has had 25 years of experience in marketing and merchandising. He will supervise the activities of business development managers for specific market areas, as well as market research and development engineering staffs. This department will be under the supervision of John E. Menz, vice president for marketing.

James H. Hinman has been named manager of aluminum industrial sales for Revere Copper & Brass Inc. He moves up from the position of manager of aluminum sales for the Dallas Division of Revere in Chicago. Earlier, Revere had announced the appointment of **John W. Eason** as manager of the Baltimore Division. He had been manager of Revere's aluminum industry sales in the New York executive office since October, 1957. As head of the Baltimore Division, Eason succeeds Jack F. Croasdale, a Revere vice president, who died suddenly in June. **Arthur W. Wainwright** has been appointed assistant manager of the Baltimore Division. He has been treasurer of the Division since 1937 and will retain this responsibility.

In another personnel move, Revere promoted **William T. Larson** to manager of aluminum extrusions and building products sales. He had been assistant manager of aluminum building products.

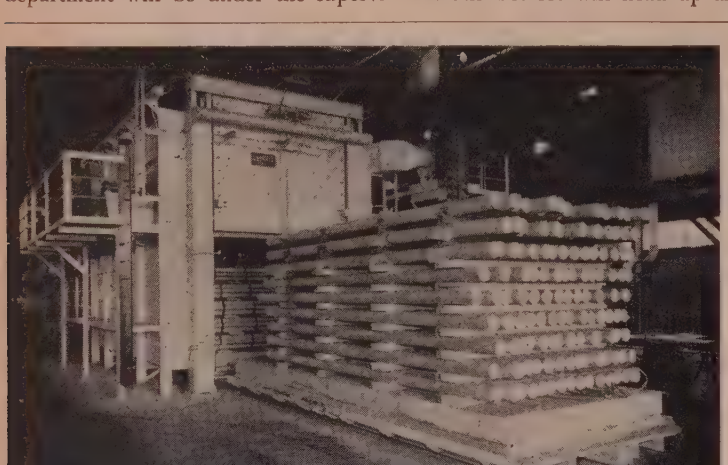
W. K. Allen Ferguson has been named general manager of the light metals manufacturing division of Reynolds Metals Co. He will head up all operations of the foil and printing divisio Ferguson joined the United States F Co. (Reynolds' parent company) in 19 He rose from the job of helper on spooler to become plant manager. has since held executive posts of creasing responsibility in manufacturi and sales. For the past year he has be serving as special assistant to the v president of operations.

New Finish For Aluminum Extrusions

A special finish to be used on 60 alloy architectural aluminum extrusio is a new technique developed by A minum Co. of America. The finish called Duranodic and is claimed to highly effective on outdoor, unma tained aluminum surfaces. The fin produces a coating with a hardness perior to ordinary anodized finishes.

Various colors are possible, rangi from bronze-silver to bronze-black depending on the coating thickness a plied. The Duranodic finish offers hi resistance to abrasion and may find u on products such as store fronts, ha rails, and installations around hi traffic areas.

Alcoa is making the production te nique available to aluminum processe without charge.



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2226 North Elston
Chicago, Illinois

Hampden Brass & Aluminum Co.
262 Liberty St.
Springfield, Mass.

Madison-Kipp Corp.
217 Waubesa Street
Madison 4, Wisconsin

CASTINGS, MAGNESIUM DIE

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

The Dow Metal Products Co.
Magnesium Department
Midland, Michigan

CASTINGS, ALUMINUM, SAND AND PERMANENT MOLD

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Light Alloys Ltd.
320 Bay St.
Toronto, Ont.

A. C. Williams Co.
Ravenna, Ohio

CASTINGS, MAGNESIUM, SAND AND PERMANENT MOLD

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada

The Dow Metal Products Co.
Midland, Michigan

Light Alloys Ltd.
320 Bay St.
Toronto, Ont.

A. C. Williams Co.
Ravenna, Ohio

CIRCLES, ALUMINUM

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Fairmont Aluminum Co.
Fairmont, W. Va.

Kaiser Aluminum & Chemical Corp.
Kaiser Center
Oakland 12, Calif.

CLEANERS, ALUMINUM

Amchem Products, Inc.
Ambler 12, Pa.

Diversey Corp.
1820 Roscoe St.
Chicago 13, Ill.

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, New Jersey

MacDermid Inc.
Waterbury 20, Conn.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector Street
New York 6, N. Y.

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

COATINGS, ELECTRICALLY CONDUCTIVE

Amchem Products, Inc.
Ambler 12, Pa.

Graphite Products Corp.
Brookfield, Ohio

COIL, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Foils, Inc.
Jackson, Tenn.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Fairmont Aluminum Company
Fairmont, West Virginia

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Johnston Foil Div.
Standard Packaging Corp.
6008 S. Broadway
St. Louis 11, Mo.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, N. Y.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Connecticut

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

COILS, PRE-ANODIZED

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

COILS, PRE PAINTED

Bridgeport Brass Co.
Aluminum Division
Bridgeport 2, Conn.

Coated Materials Div.
P. O. Box 9536
Pittsburgh 23, Pa.

COILS, PREPAINTED (cont'd)

Litho-Strip Corp.
4800 S. Kilbourn Ave.
Chicago 32, Ill.

Pre Finish Metals Inc.
2110 E. Pratt Blvd.
Elk Grove, Ill.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

COMPOUNDS, BARREL FINISHING

MacDermid Inc.
Waterbury 20, Conn.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

CONVERSION COATING FOR ALUMINUM

Amchem Products, Inc.
Ambler 12, Pa.

Egyptian Lacquer Mfg. Co.
P. O. Box 444
Newark 1, New Jersey

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Philadelphia 2, Pa.

CURTAIN WALLS, ALUMINUM

Panelfab Products, Inc.
2001 N.E. 146th St.
North Miami, Fla.

DETERGENTS

MacDermid Inc.
Waterbury 20, Conn.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

DIE STEELS FOR DIE CASTING

Latrobe Steel Co.
Latrobe, Pa.

DIE STEEL, EXTRUSION

Latrobe Steel Co.
Latrobe, Pa.

DISPERSIONS, COLLOIDAL-GRAPHITE

Grafo Colloids Co.
259 Wilkes Pl.
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

DISTRIBUTORS & JOBBERS (Al)

These firms handle aluminum sheet, plate, coils, rolled shapes, rod, bar, tubing, wire, etc.

Adam Metal Supply, Inc.
4-63 48th Ave.
Long Island City, I, N. Y.

Aluminum Distributors, Inc.
7301 W. Harrison Street
Forest Park, Illinois

Aluminum Mill Supply Corp.
42-44 Court Street
Brooklyn 1, N. Y.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Atlantic Aluminum & Metal Distributors, Inc.
Page Boulevard
Springfield, Massachusetts

Chase Brass & Copper Co.
Waterbury 20, Conn.

Peter A. Frasse and Company
17 Grand Street
New York, N. Y.

General Materials Co.
1400 Plaza Ave.
New Hyde Pk., N. Y.

J & L Steel Warehouse Div.
545 W. McCarty
Indianapolis 5, Ind.

E. M. Jorgensen Company
10650 South Alameda
Los Angeles, California

Perry Kilsby, Inc.
2501 S. Malt Ave.
Los Angeles 22, Calif.

Korhumel Steel & Aluminum Co.
2424 Oakton St.
Evanston, Ill.

Precision Steel Warehouse, Inc.
3500 North Wolf Road
Franklin Park, Illinois

Production Metals, Inc.
299 Pavonia Ave.
Jersey City 2, N. J.

Reynolds Aluminum Supply Co.
573 W. Peachtree Street, N.E.
Atlanta, Georgia

Joseph T. Ryerson & Son, Inc.
16th and Rockwell Streets
Chicago 80, Illinois

Whitehead Metals, Inc.
303 W. 10th St.
New York 14, N. Y.

DOORS, ALUMINUM, ANODIZED

Panelfab Products, Inc.
2001 N.E. 146th St.
North Miami, Fla.

DRAWING COMPOUNDS, METAL AND WIRE

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

ELECTRODES FOR WELDING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Kaiser Aluminum & Chemical Corp.
919 No. Michigan Ave.
Chicago 11, Ill.

Metal and Thermit Corp.
Rahway, New Jersey

ENAMELS, PORCELAIN ALUMINUM

Ferro Corporation
4150 E. 56th St.
Cleveland 5, Ohio

ETCHANT, ALUMINUM

Amchem Products, Inc.
Ambler 12, Pa.

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, N. J.

MacDermid Inc.
Waterbury 20, Conn.

Northwest Chemical Co.
9310 Roselawn Ave.
Detroit 4, Mich.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

EXTRUSIONS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Benson Aluminum Co., Inc.
621 Virginia St.
Connersville, Ind.

William L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Corson Industries
Delair, N. J.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Jarl Extrusions, Inc.
Linden Avenue
East Rochester, New York

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Avenue
New York 22, New York

Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Southern Extrusions Co.
North Washington Street
Magnolia, Arkansas

United States Extrusions Corp.
120 Old Broadway
Garden City Park, L. I., N. Y.

Wells Aluminum Corp.
North Liberty, Ind.

R. D. Werner Co., Inc.
Dept. 41
Greenville, Pa.

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube
Div. of Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

EXTRUSIONS, IMPACT

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif

EXTRUSIONS, IMPACT, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, MAGNESIUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada

The Dow Metal Products Co.
Midland, Michigan

EXTRUSIONS, TITANIUM

Bridgeport Brass Company
Aluminum Division
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif.

EXTRUSIONS, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

FASTENERS, ALUMINUM

Southern Screw Company
Statesville, North Carolina

FENCING, ALUMINUM

Nichols Wire & Aluminum Co.
Davenport, Iowa

FILLER METAL, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

FILLER METAL, MAGNESIUM

All-State Welding Alloys
249-55 Ferris Ave.
White Plains, N. Y.

FINISHES AND COATINGS, ALUMINUM

Amchem Products, Inc.
Ambler 12, Pennsylvania

The Chemical Corporation
54 Waltham Avenue
Springfield 9, Mass.

Conversion Chemical Corp.
101 E. Main St.
Rockville, Conn.

Diversey Corp.
1820 Roscoe St.
Chicago 13, Ill.

Eastman Chemical Products, Inc.
Kingsport, Tennessee

Egyptian Lacquer Mfg. Co.
P. O. Box 444
Newark 1, New Jersey

Frederick Gumm Chemical Co.
538 Forest St.
Kearny, N. J.

MacDermid Inc.
Waterbury 20, Conn.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

FLUXES, ALUMINUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Smelting & Refining
Maple Heights, Ohio

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

Federated Metals Div.
American Smelting & Refining Corp.
120 Broadway
New York 5, N. Y.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Park Chemical Co.
8074 Military Ave.
Detroit 4, Mich.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

FLUX, ALUMINUM SOLDERING

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

FLUX, BRAZING

All-State Welding Alloys Co., Inc.
249-55 Ferris Ave.
White Plains, N. Y.

Lucas-Milhaupt Engineering Co.
5040 South Lake Drive
Cudahy, Wisconsin

FLUX, WELDING

All-State Welding Alloys Co. Inc.
249-55 Ferris Ave.
White Plains, N. Y.

FLUXES, MAGNESIUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Avenue
White Plains, New York

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

FOIL, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Foils, Inc.
Jackson, Tenn.

Anaconda Aluminum Co.
P.O. Box 1654
Louisville 1, Ky.

Johnston Foil Div.
Standard Packaging Corp.
6008 S. Broadway
St. Louis 11, Mo.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Reynolds Metals Company
6601 West Broad St.
Richmond 18, Va.

FORGINGS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn. (Al, Ti)

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Wyman-Gordon Company
Worcester 1, Mass. (Al, Mg, Ti)

FORGINGS, COLD, NO-DRAFT

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

GINGS, COLD (cont'd)

geport Brass Company
Grand St.
idgeport 2, Connecticut
ey Aluminum
rrance, Calif.
r Aluminum & Chemical Sales
iser Center
akland 12, Calif.

GINGS, EXTRUSION, TOOL

obe Steel Co.
trobe, Pa.

GINGS, IMPACT

ninum Company of America
7 Alcoa Building
ttsburgh 19, Pa.
geport Brass Co.
Grand St.
idgeport 2, Conn.
ey Aluminum
rrance, Calif.

GINGS, MAGNESIUM

ninum Company of America
7 Alcoa Building
ttsburgh 19, Pennsylvania
geport Brass Co.
luminum Division
idgeport 2, Conn.
Dow Metal Products Co., Inc.
idland, Mich.
ey Aluminum
rrance, Calif.
nan-Gordon Company
'orcester 1, Mass. (Al, Mg, Ti)

GINGS, TITANIUM

ninum Company of America
7 Alcoa Building
ttsburgh 19, Pennsylvania
geport Brass Co.
Grand St.
idgeport 2, Conn.
ey Aluminum
rrance, Calif.
nan Gordon Company
'orcester 1. Mass.

T FOR ALUMINUM

erro Corp.
150 E. 56th St.
leveland 5, Ohio

RDWARE, DOOR, WINDOW

n-Stevens Corp.
3-53 62nd St.
Woodside, N. Y.
e Park Metal Stamping, Inc.
122 Velma Court
oungstown, Ohio

AT TREATING SALTS, ALUMINUM

k Chemical Co.
074 Military Ave.
Detroit 4, Mich.

NGES, ALUMINUM, ALL TYPES

ce Park Metal Stamping Inc.
122 Velma Court
Youngstown, Ohio

GOT, ALUMINUM (ALLOYS)

uminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York
uminum & Magnesium, Inc.
Sandusky, Ohio
uminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.
uminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.
aconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.
ex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois
derated Metals Div. ASARCO
120 Broadway
New York 5, N. Y.
rvey Aluminum
Torrance, Calif.
iser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.
n Aluminum
400 Park Ave.
New York 22, N. Y.
ynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

INGOT, MAGNESIUM (ALLOYS)

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Apex Smelting Company
2537 West Taylor Street
Chicago 12, Illinois

Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada

The Dow Chemical Co.
Magnesium Department
Midland, Michigan

INGOT, MAGNESIUM, HIGH PURITY

Alabama Metallurgical Corp.
Selma, Ala.

INGOT, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

IRRIGATION PIPE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

LUBRICANTS, CASTING

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Scott Chemical Corp.
510 W. Garfield
Glendale, Calif.

LUBRICANTS, EXTRUDING

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

LUBRICANTS, FORGING

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

LUBRICANTS, METALWORKING

Grafo Colloids Corp.
259 Wilkes Place
Sharon, Pa.

Graphite Products Corp.
Brookfield, Ohio

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Oakite Products, Inc.
50A Rector St.
New York 6, New York

Parker Rust Proof Co.
2177 E. Milwaukee Ave.
Detroit 11, Mich.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

Scott Chemical Corp.
510 W. Garfield
Glendale, Calif.

MAINTENANCE MATERIALS, PAINT SPRAY BOOTH

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

NAILS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

NUTS

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

PANELS, ALUMINUM

Panelfab Products, Inc.
2001 N.E. 146th St.
North Miami, Fla.

PARTING COMPOUNDS

Graphite Products Corp.
Brookfield, Ohio

PIG, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Transatlantic, Inc.
30 Rockefeller Plaza
New York 20, N. Y.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

PIPE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa. (Al)

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Connecticut

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Perry Kilsby Inc.
2501 S. Malt Ave.
Los Angeles 22, Calif.

Olin Aluminum
400 Park Ave.
New York 22, N. Y.

Precision Extrusions, Inc.
721 E. Green Ave.
Bensenville, Ill.

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube
Div. of Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

PLASTIC CAPS, INSERTS FOR TUBULAR FURNITURE

Impex Corp.
4049 Simon Road
Youngstown 12, Ohio

PLASTIC GLIDES, RUNNERS FOR WINDOWS, DOORS, SCREENS

Impex Corp.
4049 Simon Road
Youngstown 12, Ohio

PLATE, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Fairmont Aluminum Company
Fairmont, West Virginia

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Rockingham Road
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

PLATE, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Metal Products Co.
Midland, Michigan

PLATE, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

POLISHING, BUFFING COMPOUNDS

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

POLISHING, CHEMICAL

Alchemize Corporation
1431 South Talman Avenue
Chicago 8, Illinois

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

MacDermid Inc.
Waterbury 20, Conn.

REFRACTORIES

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

General Refractories Co.
1520 Locust St.
Philadelphia 2, Pa.

H. K. Porter Co., Inc.
Porter Bldg.
Pittsburgh 19, Pa.

Refractory Products Co.
910 Custer Ave.
Evanston, Ill.

REFRACTORY CONES for FURNACE TAP-OUT PLUGS

Refractory Products Co.
910 Custer Ave.
Evanston, Ill.

RIVETS, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

ROD AND BAR, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

ROD, BRAZING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Lucas-Milhaupt Engineering Co.
5040 S. Lake Drive
Cudahy, Wisconsin

ROD, WELDING

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Buildings
Pittsburgh 19, Pennsylvania

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

RUST PREVENTIVES

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

SCREEN WIRE, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

SCREWS, MACHINE, ALUMINUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Southern Screw Company
Statesville, North Carolina

SCREWS, TAPPING, ALUMINUM

Southern Screw Company
Statesville, North Carolina

SCREWS, WOOD, ALUMINUM

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

Southern Screw Company
Statesville, North Carolina

SHAPES, ROLL FORMED

Nichols Wire & Aluminum Company
Davenport, Iowa

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Roll Formed Products Co.
3754 Oakwood Avenue
Youngstown, Ohio

R. D. Werner Co., Inc.
Dept. 41
Greenville, Pa.

SHEET, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Aluminum Foils, Inc.
Jackson, Tenn.

Anaconda Aluminum Co.
P. O. Box 1654
Louisville 1, Ky.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Fairmont Aluminum Company
Fairmont, West Virginia

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Johnston Foil Div.
Standard Packaging Corp.
6008 S. Broadway
St. Louis 11, Mo.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Olin Aluminum
400 Park Avenue
New York 22, New York

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pa.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Conn.

Sheet Aluminum Corp.
701 Liberty St.
Jackson, Mich.

SHEET, ANODIZED

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

City Plating & Polishing Co.
22nd & Cole Street
St. Louis 6, Missouri

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

SHEET, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

The Dow Chemical Company
Magnesium Department
Midland, Mich.

SHEET, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

SOLDER, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pa.

SPOOLED ALUMINUM

All-State Welding Alloys Co., Inc.
249-55 Ferris Ave.
White Plains, N. Y.

STORM DOOR CLOSURES

Lake Park Metal Stamping Inc.
1122 Velma Court
Youngstown, Ohio

STORM DOOR LATCHES

Lake Park Metal Stamping Inc.
1122 Velma Court
Youngstown, Ohio

STRIPPERS, METAL & PAINT

Frederick Gumm Chemical Co., Inc.
538 Forest St.
Kearny, N. J.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

STRUCTURALS, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Company of America
877 Alcoa Building
Pittsburgh 19, Pennsylvania

Willam L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Corson Industries
Delair, N. J.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

United States Extrusions Corp.
120 Old Broadway
Garden City Park, L. I., N. Y.

THORIUM METAL

Davison Chemical Co., Div.
of W. R. Grace & Co.
Erwin, Tenn.

Dominion Magnesium, Ltd.
Suite 1505, 320 Bay St.
Toronto, Canada

TITANIUM, POWDER

United International Research, Inc.
Long Island City 1, N. Y.

TOOLING PLATE, MAGNESIUM

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

TREAD PLATE, MAGNESIUM

The Dow Chemical Co.
Magnesium Dept.
Midland, Mich.

TUBED SHEET, ALUMINUM

Olin Roll-Bond Division
East Alton, Ill.

Reynolds Metals Co.
6601 W. Broad St.
Richmond 18, Va.

TUBING, ALUMINUM

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

William L. Bonnell Co., Inc.
Newnan, Ga.

Bridgeport Brass Company
30 Grand St.
Bridgeport 2, Conn.

Corson Industries
Delair, N. J.

General Extrusions, Inc.
4040 Lake Park Road
Youngstown, Ohio

Harvey Aluminum
Torrance, Calif.

Jarl Extrusions, Inc.
Linden Avenue
East Rochester, New York

Kaiser Aluminum & Chemical Sales
Kaiser Center
Oakland 12, Calif.

Perry Kilsby Inc.
2501 S. Malt Ave.
Los Angeles 22, Calif.

Olin Aluminum
400 Park Avenue
New York 22, New York

Precision Extrusions, Inc.
721 East Green Street
Bensenville, Illinois

Quaker State Metals Co.
Manheim Pike at 230 Bypass
Lancaster, Pennsylvania

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Southern Extrusions Company
North Washington Street
Magnolia, Arkansas

United States Extrusions Corp.
120 Old Broadway
Garden City Park, L. I., N. Y.

R. D. Werner Co., Inc.
Dept. 41
Greenville, Pa.

Wells Aluminum Corp.
North Liberty, Ind.

Wolverine Tube
Div. Calumet & Hecla, Inc.
17200 Southfield Rd.
Allen Park, Mich.

TUBING, MAGNESIUM

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Dominion Magnesium, Ltd.
320 Bay Street
Toronto, Ont., Canada

The Dow Metal Products Co., Inc.
Midland, Michigan

TUBING, ZIRCONIUM

Harvey Aluminum
Torrance, Calif.

Wolverine Tube
Div. Calumet & Hecla Inc.
17200 Southfield Rd.
Allen Park, Mich.

VENETIAN BLIND STOCK

Bridgeport Brass Co.
30 Grand St.
Bridgeport 2, Conn.

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

WIRE, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Avenue
White Plains, New York

Aluminium Limited Sales, Inc.
630 Fifth Avenue
New York 20, New York

Aluminum Co. of America
877 Alcoa Building
Pittsburgh 19, Pa.

Nichols Wire & Aluminum Co.
Davenport, Iowa

Reynolds Metals Company
6601 W. Broad St.
Richmond 18, Va.

Scovill Manufacturing Co.
99 Mill Street
Waterbury, Conn.

WIRE, PRECISION SPOOLED, ALUMINUM

All-State Welding Alloys Co.
249-55 Ferris Ave.
White Plains, N. Y.

WIRE DRAWING COMPOUNDS

L. R. Kerns Co.
2657 E. 95th St.
Chicago, Ill.

Oakite Products, Inc.
50A Rector St.
New York 6, N. Y.

Pennsalt Chemicals Corp.
Three Penn Center
Philadelphia 2, Pa.

EQUIPMENT

ANODIZING EQUIPMENT

The Meaker Co.
1629 S. 55th Ave.
Chicago 50, Ill.

The Gilbert Tramer Co.
1217 Main
Cleveland, Ohio

BARREL FINISHING EQUIPMENT

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

BEARINGS

Morgan Construction Co.
Worcester, Mass.

BELT GRINDERS, ABRASIVE

Hammond Machinery Builders
1600 Douglas Ave.
Kalamazoo, Michigan

BILLET CUTTERS

Loma Machine Manufacturing Co
114 East 32nd Street
New York 16, New York

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

BILLET HEATERS

Ajax-Magnethermic Corp.
3990 Simon Road
Youngstown 7, Ohio

Granco, Inc.
317 32nd St., S.W.
Grand Rapids 8, Mich.

Hevi-Duty Electric Co.
Div. Basic Products Corp.
2040 W. Wisconsin Ave.
Milwaukee 1, Wis.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

BUFFING & POLISHING EQUIPMENT

Hammond Machinery Builders
1600 Douglas Ave.
Kalamazoo, Michigan

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

CASTING EQUIPMENT, BILLET

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

CASTING MACHINES CONTINUOUS

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

COATING THICKNESS TESTER

Unit Process Assemblies, Inc.
61 E. 4th St.
New York 3, N. Y.

COLD DRAW EQUIPMENT

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

COLD DRAWING MACHINE, CONTINUOUS

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

OUR CORRECTING CHINES

Engineering Co.
National Bank Bldg.
burgh 22, Pa.

NG MACHINES

Machine Mfg. Co., Inc.
E. 32nd St.
York 16, N. Y.

r Machine Tool Inc.
Adeline St.
Haven, Conn.

-Man Machine Co.
1269
oxville 1, Tenn.

ING MACHINES, WIRE

r Machine Tool Inc.
Adeline St.
v Haven, Conn.

OFF MACHINES

ican Roller Die Corp.
10 Clayton Avenue
ckliffe, Ohio

Machine Mfg. Co., Inc.
E. 32nd St.
w York 16, N. Y.

gan Roll Form, Inc.
9 Hubbell
roit 28, Mich.

r Machine Company
Sixth Street, N.W.
nd Rapids 2, Michigan

-Man Machine Co.
x 1269
oxville 1, Tenn.

Yoder Company
9 Walworth Ave.
veland 2, Ohio

VISTING MACHINES

y-Hydropress
. Baldwin-Lima-Hamilton
Fifth Avenue
w York 3, New York

a Machine Mfg. Co., Inc.
1 E. 32nd St.
w York 16, N. Y.

on Engineering Co.
rst National Bank Bldg.
ttsburgh 22, Pa.

son-Stillman Press Div.
rrel-Birmingham Co., Inc.
5 Blossom Road
chester 10, N. Y.

CASTING MACHINES

T Machinery Co.
iv. Greenlee Bros. & Co.
7 W. Eighth St.
olland, Mich.

-Master
iv. of Koehring Co.,
ydraulic Press Mfg. Div.
3901 Aurora Road
edford, Ohio

wy-Hydropress
iv. Baldwin-Lima-Hamilton
11 Fifth Avenue
ew York 3, New York

son-Stillman Press Div.
arrel-Birmingham Co., Inc.
55 Blossom Road
ochester 10, N. Y.

HEATERS

Carl Mayer Corp.
0800 Center Ridge Rd.
leveland 16, Ohio

Lanly Co.
800 Euclid Ave.
leveland 15, Ohio

S, DIE CASTING

ha Industries, Inc.
15 Center Ave.
ogansport, Ind.

manent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

S, EXTRUSION

ke Park Tool & Die Co.
122 Velma Court
Youngstown, Ohio

rdis Tool & Die Co.
P. O. B. 134
Mechanicsburg, Pa.

czik Tool & Die Works
9511 Grinnell Avenue
Detroit 13, Michigan

ID Extrusion Die Co.
5747 Beebe Ave.
Warren, Mich.

Supreme Extrusion Die & Tool
106 E. Ten Mile Road
Hazel Park, Mich.

DIES, NOTCHING

Michigan Roll Form, Inc.
8909 Hubbell
Detroit 28, Mich.

DIES, PERMANENT MOLD

Permanent Mold Die Co., Inc.
2375 E. 9-Mile Rd.
Hazel Park, Mich.

DIES, ROLL FORMING

American Roller Die Corp.
29501 Clayton Avenue
Wickliffe, Ohio

Brunken & Goodwin Tool Engineering
7 North Second St.
Maywood, Ill.

Michigan Roll Form
8909 Hubbell
Detroit 28, Mich.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

DOCK BOARDS, MAGNESIUM

Brooks & Perkins, Inc.
1950 W. Fort St.
Detroit 16, Mich.

DRAWBENCHES

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

DRILLS (MULTIPLE) for EXTRUSIONS

Clark Automation Equipment Co.
419 W. Main St.
Belding, Mich.

DRYERS, STRIP & SHEET, CONTINUOUS

U. S. Hoffman Machinery Corp.
103 4th Ave.
New York 3, N. Y.

DUST COLLECTION UNITS

Hammond Machinery Builders, Inc.
1609 Douglas Avenue
Kalamazoo, Michigan

ELECTROPLATING EQUIPMENT

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

EXTRUSION BOARDS, GRAPHITE

Becker Brothers Carbon Co.
3450 South Laramie Avenue
Cicero 50, Illinois

EXTRUSION COILERS

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

EXTRUSION COOLING DEVICES

Clark Automation Equipment Co.
419 W. Main St.
Belding, Mich.

EXTRUSION HANDLING SYSTEMS

Clark Automation Equipment Co.
419 W. Main St.
Belding, Mich.

EXTRUSION PRESSES

(See PRESSES)

EXTRUSION PRESS TOOLS

Ajax Steel & Forge Co.
205 Adair St.
Detroit 7, Mich.

FILMS, X-RAY

Eastman Kodak Company
X-Ray Division
343 State Street
Rochester 4, New York

Picker X-Ray Corporation
25 S. Broadway
White Plains, New York

FOIL MILLS

Blaw-Knox Co.
Blawnox, Pa.

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

United Engineering & Foundry Co.
Pittsburgh 22, Pennsylvania

FORMING MACHINES

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

The Yoder Co.
5539 Walworth Ave.
Cleveland 2, Ohio

FORMING ROLLS

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

The Yoder Company
5539 Walworth Avenue
Cleveland 2, Ohio

FURNACE CONTROL EQUIPMENT

Morgan Construction Co.
Worcester, Mass.

FURNACES, HEAT TREATING

Hevi-Duty Electric Co.
Div. Basic Products Corp.
2040 W. Wisconsin Ave.
Milwaukee 1, Wis.

Holcroft & Co.
6545 Epworth Blvd.
Detroit 10, Mich.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Illinois

Magnethermic Corporation
3990 Simon Road
Youngstown 7, Ohio

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

W. S. Rockwell Co., Inc.
2068 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

FURNACES, HEATING

Hevi-Duty Electric Co.
Div. Basic Products Corp.
2040 W. Wisconsin Ave.
Milwaukee 1, Wis.

The Lanly Company
755 Prospect Avenue
Cleveland, Ohio

Magnethermic Corporation
3090 Simon Road
Youngstown 7, Ohio

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

W. S. Rockwell Co., Inc.
2068 Eliot Street
Fairfield, Conn.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

FURNACES, MELTING

Ajax Engineering Corp.
P. O. Box 1418
Trenton 7, N. J.

Hevi-Duty Electric Co.
Div. Basic Products Corp.
2040 W. Wisconsin Ave.
Milwaukee 1, Wis.

Lindberg Engineering Co.
2446 W. Hubbard
Chicago, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

Swindell-Dressler Corp.
P. O. Box 1888
Pittsburgh, Pa.

GENERATORS, GAS ATMOSPHERE

Hevi-Duty Electric Co.
Div. Basic Products Corp.
2040 W. Wisconsin Ave.
Milwaukee 1, Wis.

Lindberg Engineering Co.
2446 W. Hubbard St.
Chicago 12, Ill.

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

GRINDERS, BELT

Hammond Machinery Builders, Inc.
1609 Douglas Avenue
Kalamazoo, Michigan

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

GRINDERS, DISC

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

GRINDER — POLISHER

American Laubscher Corp.
250 W. 57th St.
New York 19, N. Y.

Hammond Machinery Builders, Inc.
1609 Douglas Avenue
Kalamazoo, Michigan

Madison-Kipp Corp.
217 Wabesa Street
Madison 4, Wisconsin

LATHES, BUFFING & POLISHING

Hammond Machinery Builders, Inc.
1609 Douglas Avenue
Kalamazoo, Michigan

LEVELERS, ROLLER SHEET

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Stanat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

Sutton Engineering Co.
First National Bank Bldg.
Pittsburgh 22, Pa.

F. A. Woehr Machine Co.
17 Favor St.
Rochester, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

LEVELERS—ROLLER & STRETCHER

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Stanat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

United Engineering & Foundry Co.
Pittsburgh 22, Pennsylvania

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

MILLING MACHINES

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

MOLDS, INGOT

American Car & Foundry Div.
ACF Industries, Inc.
30 Church Street
New York 8, New York

Lobeck Casting Processes Inc.
114 E. 32nd St.
New York 16, N. Y.

OVENS, AGEING

Hevi-Duty Electric Co.
Div. Basic Products Corp.
2040 W. Wisconsin Ave.
Milwaukee 1, Wis.

The Lanly Co.
2800 Euclid Ave
Cleveland 15, Ohio

The Carl Mayer Corp.
20800 Center Ridge Rd
Cleveland 16, Ohio

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

OVENS, HEAT TREATING

Ajax-Magnethermic Corporation
3990 Simon Road
Youngstown 7, Ohio

Hevi-Duty Electric Co.
Div. Basic Products Corp.
2040 W. Wisconsin Ave.
Milwaukee 1, Wis.

The Lanly Company
2800 Euclid Ave.
Cleveland 15, Ohio

Lindberg Engineering Co.
2446 Hubbard St.
Chicago 12, Ill.

The Carl Mayer Corporation
20800 Center Ridge Rd.
Cleveland 16, Ohio

Sunbeam Equipment Corp.
180 Mercer St.
Meadville, Pa.

PISTON CORES

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

PLATING EQUIPMENT

The Meaker Co.
1629 S. 55th Ave.
Chicago 50, Ill.

PRESSES, DRAWING, FORMING, STAMPING, ETC.

E. W. Bliss Co.
1375 Raff Road, S.W
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

PRESSES, EXTRUSION

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

PRESSES, FORGING

E. W. Bliss Co.
1375 Raff Road, S.W.
Canton, Ohio

Feller Engineering Company
1159 Empire Building
Pittsburgh 22, Pennsylvania

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

United Engineering & Foundry Co.
Pittsburgh 22, Pa.

Watson-Stillman Press Div.
Farrel-Birmingham Co., Inc.
565 Blossom Road
Rochester 10, N. Y.

RACKS, ANODIZING

Servi-Sure Mfg. Co.
131 N. Green St.
Chicago 7, Illinois

RACKS, SHEET CRATING

Progressive Mfg. Co.
969 Kansas Avenue
Kansas City 5, Kan.

RECTIFIERS—GERMANIUM & SELENIUM CO.

The Gilbert Tramer Co.
1217 Main Ave.
Cleveland 13, Ohio

REELS, PAY-OFF

Mettler Machine Tool Inc.
155 Adeline St.
New Haven, Conn.

F. A. Woehr Machine Co.
17 Favor St.
Rochester, N. Y.

RINGS, BRAZING

Lucas-Milhaupt Engineering Co.
5040 S. Lake Drive
Cudahy, Wisconsin

ROLL FORMING EQUIPMENT

American Roller Die Corp.
29510 Clayton Avenue
Wickliffe, Ohio

Dahlstrom Machine Works
4227 W. Belmont Ave.
Chicago, Ill.

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

Michigan Roll Form, Inc.
8909 Hubbell
Detroit 28, Mich.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

ROLLS, ROLL FORMING

American Roller Die Corp.
29501 Clayton Ave.
Wickliffe, Ohio

Brunken & Goodwin Tool Engineering
7 North Second St.
Maywood, Ill.

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

The Yoder Company
5539 Walworth Ave.
Cleveland 2, Ohio

ROLLING MILLS

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

Blaw-Knox Co.
Blawnox, Pa.

E. W. Bliss Company
Salem, Ohio

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co. Inc.
114 E. 32nd St.
New York 16, N. Y.

Mesta Machine Co.
P. O. Box 1466
Pittsburgh 30, Pa.

Morgan Construction Co
Worcester, Mass.

Stanat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

United Engineering & Foundry Co
Pittsburgh 22, Pa.

ROLLING MILL AUXILIARY EQUIPMENT

The Aetna-Standard Div.
Frick Building
Pittsburgh 30, Pa.

Blaw-Knox Co.
Blawnox, Pa.

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Morgan Construction Co.
Worcester, Mass.

Stanat Mfg. Co.
500 Shames Drive
Westbury, N. Y.

Sutton Engineering Company
First National Bank Building
Pittsburgh 22, Pennsylvania

United Engineering & Foundry Co
Pittsburgh 22, Pa.

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SAW BLADES, CIRCULAR

Heinemann Saw Corp.
Canton 6, Ohio

Industrial Sales Co., Inc.
2608 Main St.
Buffalo 14, N. Y.

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

North American Products Co.
P. O. Box 291M
Jasper, Ind.

SAWS, BAND

Oliver Machinery Company
445 Sixth Street, N.W.
Grand Rapids 2, Michigan

SAWS, CIRCULAR

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Co.
445 Sixth St., N.W.
Grand Rapids 2, Mich.

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

SAWS, CUT-OFF

Loma Machine Mfg. Co.
114 E. 32nd St.
New York 16, N. Y.

Oliver Machinery Co.
445 Sixth St., N.W.
Grand Rapids 2, Mich.

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

SAWS, MITRE

LeTarte Metal Specialties Co.
18105 E. Nine Mile Rd.
East Detroit, Mich.

SAWS, RADIAL ARM TYPE

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

Ty-Sa-Man Machine Co.
Box 1269
Knoxville 1, Tenn.

SCALPERS, INGOT

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

SHEARING EQUIPMENT

E. W. Bliss Company
Salem, Ohio

Loewy-Hydropress
Div. Baldwin-Lima-Hamilton
111 Fifth Avenue
New York 3, New York

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

United Engineering & Foundry Co.
Pittsburgh, Pennsylvania

Youngstown Foundry & Machine Co.
Reserve Street
Youngstown 2, Ohio

SHEET CASTING MACHINES, CONTINUOUS

Hunter Engineering Co.
1495 Columbia Ave.
Riverside, Calif.

SHELL MOLDING PATTERNS

Permanent Mold Die Co., Inc.
2275 E. Nine Mile Road
Hazel Park, Mich.

SLITTING EQUIPMENT

The Aetna-Standard Div.
Blaw-Knox Co.
Frick Building
Pittsburgh 30, Pa.

E. W. Bliss Company
Salem, Ohio

Loma Machine Mfg. Co., Inc.
114 E. 32nd St.
New York 16, N. Y.

The Lockformer Co.
4617 W. Roosevelt Rd.
Chicago 50, Ill.

The Yoder Company
5539 Walworth Avenue
Cleveland 2, Ohio

Youngstown Foundry & Machine Co.
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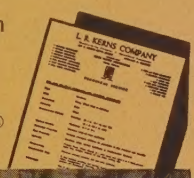

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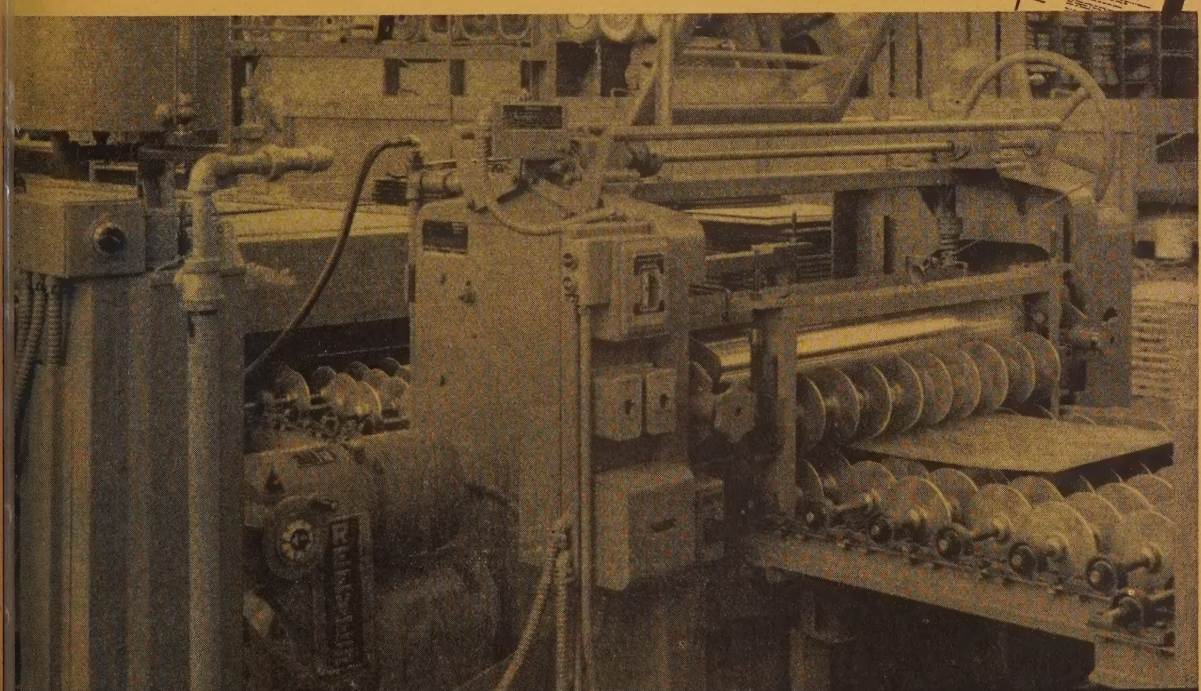

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Looking Ahead

The prolonged steel strike is beginning to have its effect on the aluminum industry, and the drag may be felt for some months after the dispute is either settled or temporarily interrupted by a Taft-Hartley injunction. Many big aluminum users – appliance firms, auto makers, and the like – cannot keep their plants humming without steel. Result: All materials, including aluminum, suffer. But once the economy climbs back to some sort of normal condition, aluminum should reap a net gain. Reason: Steel-starved companies that have been making eyes at aluminum will make the jump rather than do without steel. Many of them are bound to stick with aluminum even after steel is abundantly available.

But the steel shortage had little, if anything, to do with the 43% drop in shipments of aluminum sheet in August. The Aluminum Association reported that combined shipments of 16 reporting companies slumped from 86,569 tons in July to 48,675 tons in August. It's not as bad as it looks, though. For one thing, the July total was abnormally high, reflecting some hedge buying while the aluminum labor outlook was still cloudy. What's more, the shipment of 527,862 tons of aluminum sheet and plate in the first eight months of this year is a solid 36% ahead of the total in last year's like period. Shipments of all mill products in July totaled 186,500 tons – 31% above the July '58 total, and 9% higher than the previous month's shipments. It was a record month by a comfortable margin.

Aluminum casting business has also surged ahead, with first half shipments running better than 40% higher than in the same period last year. The total for this year's first half was 209,250 tons, compared with 144,400 tons in 1958's first six months. And despite a slight seasonal decline in June, second quarter shipments (103,900 tons) were 60% higher than the 64,850 tons shipped in last year's second quarter. All of this lends strong support to the American Die Casting Institute's prediction that aluminum die casting production this year will rack up a 34% gain over last year's volume. ADCI expects output to reach 195,000 tons in '59, compared with the 145,125 tons of aluminum castings produced last year. And with auto sales expected to spurt in '60, die casting output should move still higher.

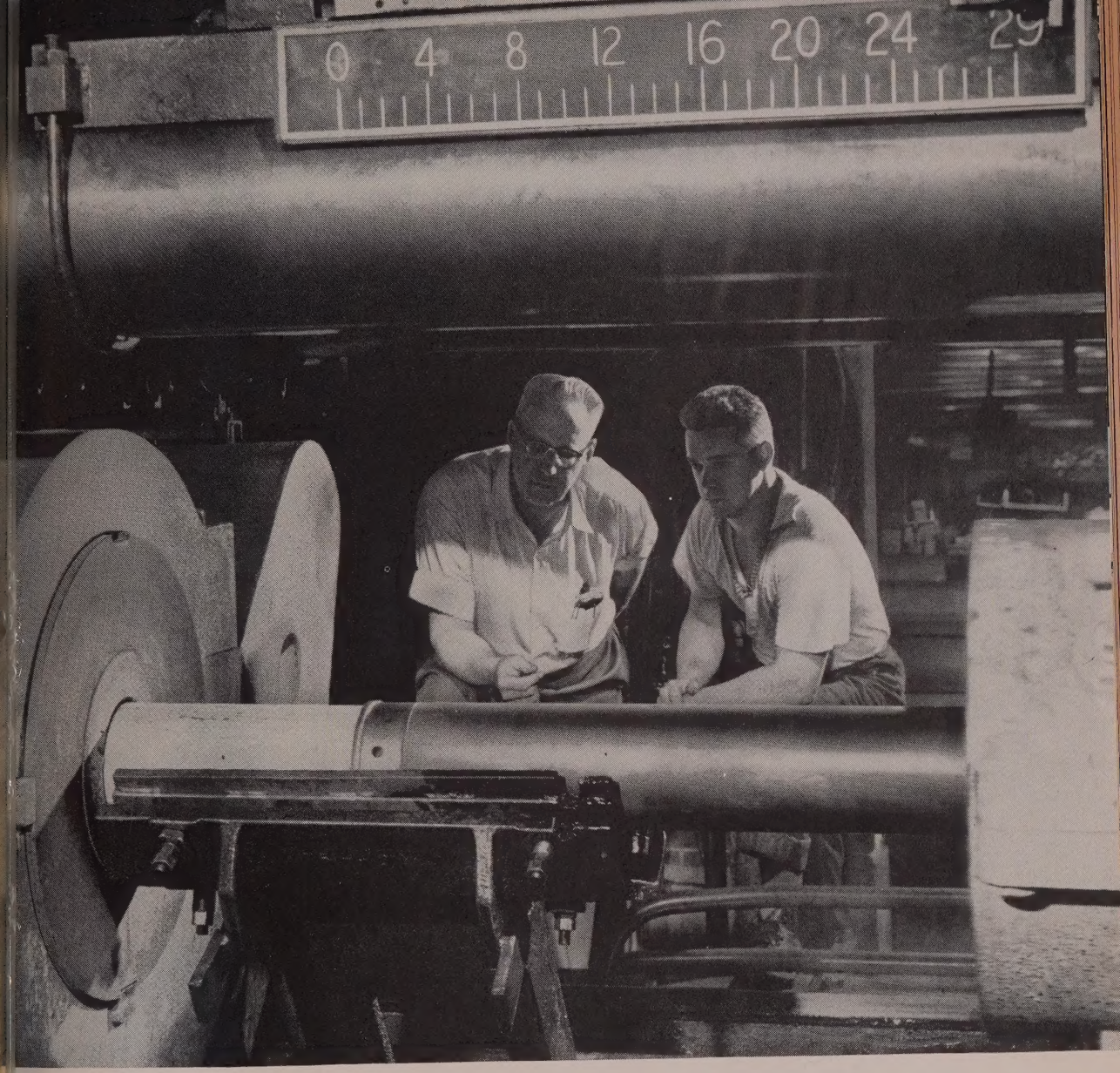
Rising sales volume has encouraged Aluminium Limited to reactivate some 35,000 tons of primary aluminum capacity, boosting the production rate of Aluminum Co. of Canada, its chief operating subsidiary, to around 565,000 tons annually. The move represents a 6.6% increase, the c pany explained, and "reflects a slight impr ment in market conditions." U. S. produc are also continuing their high levels of op tion, with primary production in Septem holding at near the August rate of about 168, tons. Optimism over the aluminum output next year is evident in this action.

Makers of summer and casual furniture are report increased sales this year and predicting furt gains in 1960. Speaking for Lawnlite of Mia a big maker of aluminum furniture, Vic Reiter said that this year's sales rose 12% o last year's and that another 10% increase is pected in '60. All-Luminum Products, Philad phia, reported a 15% rise, and expects anot 6% increase next year. A 33% jump was ported by George McArthur & Sons, Barab Wis., and sales in 1960 are expected to rise other 20%. Troy Sunshade of Troy, Ohio lo for a 10% gain next year to top this year's increase. Troy's new Pavilion group is all-a minum. Speaking for the entire industry, W. McTyeire, Jr., president of the Summer & ual Furniture Manufacturers Association, s that the sales gain should average 17% in

Magnesium baseball bats, first introduced about years ago by Dixie Walker, are now gettin closer look than before. They can be precisi made to fit any whim; are the same weight the wood jobs; are practical, and can be m competitively. The baseball bat market, w with thousands of little leagues, is bigger th you may think. And those wood things do last forever. Dixie Walker and some associa are trying to get a magnesium bat that wo answer all needs. One problem: The dam things would never wear out. The replacem market would only be for thefts, souvenirs, for husbands whose needs are for batting heads of unmanageable wives and young linquents.

Home building may slip in 1960, despite what hear about increased demand for dwelli Major reason is the tight money market, hig interest rates, and the ceiling on governm backed mortgages. Lumber prices have tur downward by 10% in the past month, houses just aren't selling as fast as earlier year. On the positive side is the fact that betw 800,000 and 900,000 families are being for each year; that this number will increase million a year in 1960. Our guess: There be between 1.1 and 1.5 million housing st annually for the next 10 years or more.

— The Ed



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